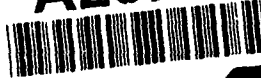




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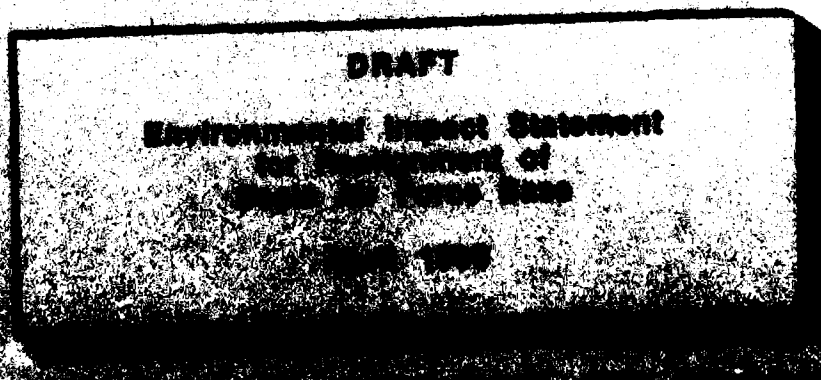
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COVER SHEET

- a. Responsible Agency: U.S. Air Force
- b. Action: In response to the recommendations of the Defense Secretary's Commission on Base Realignment and Closure, the legislative requirements in the Base Closure and Realignment Act (Public Law 100-526), and to U.S. Air Force plans to enhance mission readiness and national security, Beale Air Force Base (AFB), located near Marysville, California, is planned to be realigned. The 323rd Flying Training Wing now located at Mather AFB (located about 60 miles to the south) would be moved to Beale AFB. Construction of approximately 1.7 million square feet of new facilities and demolition of several existing buildings will be required.
- c. Contact for Further Information: HQ SAC/DEVP, Offutt AFB, NE
402/294-3684
- d. Designation: Draft Environmental Impact Statement (DEIS)
- e. Abstract: This statement assesses the potential environmental impacts from realignment of Beale AFB, located near Marysville, California. Realignment will increase on-base activity and require construction of new facilities. Existing air quality may be affected by both construction and operational activities. Operational impacts will not be significant with respect to local and regional air quality because operations will occur within the same air basin as they did at Mather AFB. Biological habitats including vernal pools and other wetlands and riparian habitats may be affected by construction of new facilities; however, no Federal- or State-listed threatened or endangered species are expected to be affected. Realignment will create additional peak period round trips, resulting in impacts on base access, intersections, and parking lots. Portions of the water distribution system and the water treatment facilities will have to be upgraded to meet the increased demand expected as a result of the realignment. If the potential presence of abandoned underground storage tanks in areas planned for construction of new facilities and asbestos-containing materials in buildings planned for demolition or modification is verified, confirmatory studies and appropriate remedial actions will be required. The realignment will have a positive effect on the local and regional economy.
- f. Comments on the Draft EIS should be addressed to HQ SAC/DEVP at the address noted above. The comment period ends on June 12, 1990. Notice of a hearing on the Draft EIS will appear in local newspapers. HQ SAC/DEVP can also be contacted for information on this hearing

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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
LIST OF ACRONYMS	x
EXECUTIVE SUMMARY	ES-1
1.0 DESCRIPTION OF AND NEED FOR THE REALIGNMENT ACTION	1-1
1.1 INTRODUCTION	1-1
1.2 LOCATION OF BEALE AFB	1-2
1.3 SCOPING SUMMARY AND PREPLANNING ANALYSIS	1-2
1.4 RELEVANT FEDERAL, STATE, AND LOCAL STATUTES, REGULATIONS, AND GUIDELINES	1-5
2.0 ALTERNATIVES INCLUDING THE REALIGNMENT ACTION	2-1
2.1 INTRODUCTION	2-1
2.2 DETAILED DESCRIPTION OF THE REALIGNMENT ACTION	2-1
2.2.1 Realignment Action	2-1
2.2.2 Construction and Facility Siting Alternatives	2-5
2.2.3 Required Construction and Facilities	2-7
2.2.3.1 Consolidated Aircraft Maintenance Complex (CAMS)	2-7
2.2.3.2 Base Operating Support Complex (BOS)	2-16
2.2.3.3 Academic Complex	2-18
2.2.3.4 Family Housing	2-21
2.2.3.5 Demolition Candidates	2-22
2.3 SUMMARY OF MAJOR ISSUES AND POTENTIAL IMPACTS	2-22
3.0 AFFECTED ENVIRONMENT	3-1
3.1 INTRODUCTION	3-1
3.1.1 History	3-1
3.1.2 Mission	3-1

TABLE OF CONTENTS (cont'd)

3.1.3	Existing Development	3-2
3.2	GEOLOGY, TOPOGRAPHY	3-2
3.2.1	Geologic Setting	3-2
3.2.2	Geomorphology	3-6
3.2.3	Seismic Activity	3-8
3.2.4	Soils	3-8
3.3	AIR QUALITY	3-9
3.3.1	Climate	3-9
3.3.2	Air Resources	3-9
3.4	WATER RESOURCES	3-13
3.4.1	Groundwater	3-13
3.4.2	Surface Water	3-13
3.4.3	Water Quality	3-15
3.4.3.1	Groundwater	3-15
3.4.3.2	Surface Water	3-16
3.5	BIOLOGICAL RESOURCES	3-16
3.5.1	Vegetative Resources	3-16
3.5.1.1	General	3-16
3.5.1.2	Threatened, Endangered, and Sensitive Species	3-17
3.5.2	Wildlife Resources	3-17
3.5.2.1	General	3-17
3.5.2.2	Threatened, Endangered, and Sensitive Species ..	3-20
3.6	ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES	3-20
3.7	NOISE	3-21
3.7.1	Existing Noise Conditions	3-22
3.8	LAND USES	3-24
3.8.1	Accident Potential	3-24
3.8.2	Height and Obstruction Criteria	3-25

TABLE OF CONTENTS (cont'd)

3.9	TRANSPORTATION	3-25
3.9.1	Access	3-25
3.9.2	On-Base Roads	3-27
3.9.3	Bus Operations	3-27
3.9.4	Railroad	3-30
3.10	UTILITIES	3-30
3.10.1	Electric Supply	3-30
3.10.2	Water Supply	3-30
3.10.3	Communication	3-32
3.11	WASTE MANAGEMENT	3-32
3.11.1	Solid Waste Disposal	3-32
3.11.2	Wastewater Disposal	3-33
3.11.3	Hazardous Waste Generation and Disposal	3-33
3.11.4	Beale AFB Installation Restoration Program	3-34
3.11.5	Underground Storage Tanks	3-34
3.11.6	Asbestos	3-41
3.12	SOCIOECONOMIC FACTORS	3-41
3.12.1	Demographics	3-41
3.12.2	Economic Characteristics	3-45
3.12.3	Housing	3-48
3.12.4	Education	3-49
3.12.5	Community Service Facilities	3-49
4.0	ENVIRONMENTAL CONSEQUENCES	4-1
4.1	MISSION AND OPERATION	4-1
4.2	GEOLOGY, TOPOGRAPHY	4-1
4.2.1	Cumulative Impacts	4-2
4.2.2	Mitigation Measures	4-2
4.3	AIR QUALITY	4-3
4.3.1	Cumulative Impacts	4-7
4.3.2	Mitigation Measures	4-11

TABLE OF CONTENTS (cont'd)

4.4	WATER RESOURCES	4-12
4.4.1	Cumulative Impacts	4-12
4.4.2	Mitigation Measures	4-13
4.5	BIOLOGICAL RESOURCES	4-13
4.5.1	Cumulative Impacts	4-14
4.5.2	Mitigation Measures	4-14
4.6	ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES	4-15
4.6.1	Cumulative Impacts	4-16
4.6.2	Mitigation Measures	4-16
4.7	NOISE	4-16
4.7.1	Cumulative Impacts	4-18
4.7.2	Mitigation Measures	4-18
4.8	LAND USES	4-18
4.8.1	Cumulative Impacts	4-18
4.8.2	Mitigation Measures	4-18
4.9	TRANSPORTATION	4-18
4.9.1	Cumulative Impacts	4-19
4.9.2	Mitigation Measures	4-19
4.10	UTILITIES	4-22
4.10.1	Cumulative Impacts	4-22
4.10.2	Mitigation Measures	4-22
4.11	WASTE MANAGEMENT	4-23
4.11.1	Cumulative Impacts	4-24
4.11.2	Mitigation Measures	4-24
4.12	SOCIOECONOMICS	4-25
4.12.1	Cumulative Impacts	4-29
4.12.2	Mitigation Measures	4-29
4.13	UNAVOIDABLE ADVERSE IMPACTS	4-29
4.14	RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY	4-29

TABLE OF CONTENTS (cont'd)

4.15	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES	4-30
5.0	REFERENCES	5-1
6.0	LIST OF PREPARERS AND ORGANIZATIONS AND PERSONS CONTACTED	6-1
6.1	PREPARERS	6-1
6.2	ORGANIZATIONS AND PERSONS CONTACTED	6-2
APPENDIX A:	Average Daily Air Emissions Inventory for Yuba County	A-1
APPENDIX B:	Archaeological, Cultural, and Historic Resources	B-1
APPENDIX C:	Noise Metrics	C-1

LIST OF TABLES

<u>No.</u>		<u>Page</u>
1-1	Summary of Relevant Federal, State, and Local Statutes, Regulations, and Guidelines	1-6
2-1	Estimates of Full-Time Personnel Affected by Realignment	2-2
2-2	Aircraft Operations and Expected Changes in Operations at Beale AFB	2-6
2-3	Programmed Project Cost and Budget Year	2-8
2-4	Consolidated Aircraft Maintenance (CAMS) Complex	2-15
2-5	Base Operating Support	2-17
2-6	Academic Complex	2-19
2-7	Buildings Considered for Demolition	2-23
2-8	Major Potential Realignment Impacts on Key Areas of Concern	2-24
3-1	Units Assigned to Beale AFB as of 8 February 1990	3-3
3-2	Summary of Relevant Air Quality Data Surrounding Beale Air Force Base, 1985-1987	3-11
3-3	Maximum Background Air Quality Concentrations Surrounding Beale Air Force Base, 1985-1987	3-12
3-4	Threatened, Endangered, and Sensitive Plant and Wildlife Species That May Occur in the Vicinity of Beale AFB, California	3-18
3-5	Gate Traffic Volumes at Beale AFB	3-28
3-6	Utilization of Major Base Parking Lots	3-29
3-7	Annual Forecasted Quantities of Waste Generated at Beale AFB	3-35
3-8	Beale AFB IRP Sites Summary	3-37
3-9	Summary of Asbestos Registry for Buildings Planned or Considered for Demolition or Modification	3-42
3-10	Estimated Population of Communities Surrounding Beale AFB	3-44
3-11	Annual Average Civilian Wage and Salary Employment, Yuba City Metropolitan Statistical Area, 1987 (Yuba and Sutter Counties, CA)	3-46

LIST OF TABLES (cont'd)

<u>No.</u>		<u>Page</u>
3-12	Payroll and Expenditures and Estimated Impacts in 50-Mile Economic Impact Region in 1988	3-47
3-13	Beale AFB Students Enrolled in Yuba and Sutter County Public Schools, FY 1989-90, by Assistance Category and School Capacity	3-50
4-1	Maximum Daily Construction Emissions	4-4
4-2	Total Construction Emissions	4-5
4-3	Daily and Annual Aircraft Emissions From SUNT Operations	4-8
4-4	Daily Secondary Emissions From SUNT Operations	4-9
4-5	Annual Secondary Emissions From SUNT Operations	4-10
4-6	Impact on Peak Period Round Trips	4-20
A-1	1983 Base Year Inventory Average Daily Air Emissions, Yuba County	A-2
B-1	Previously Recorded Archaeological Sites on Beale Air Force Base	B-3
B-2	Historical Locations on Beale Air Force Base	B-6
C-1	Loudness and Sound Levels of Everyday Noise	C-3

LIST OF FIGURES

<u>No.</u>		<u>Page</u>
1-1	General Location Map	1-3
2-1	Comprehensive Plan, Beale Air Force Base	2-10
2-2	Comprehensive Plan, Beale Air Force Base	2-11
2-3	Comprehensive Plan, Beale Air Force Base	2-12
2-4	Comprehensive Plan, Beale Air Force Base	2-13
3-1	Functional Areas	3-4
3-2	Geographic Setting	3-5
3-3	Schematic of Geomorphic Units at Beale Air Force Base	3-7
3-4	Major Surface Water Drainage Systems	3-14
3-5	Noise Contours (L_{dn})	3-23
3-6	Base Access	3-26
3-7	Water Distribution System	3-31
3-8	IRP Site Locations	3-36
4-1	Noise Contours (L_{dn}) for Operations	4-17
B-1	Predicted Zones of Prehistoric Resource Occurrence	B-2
C-1	Examples of Average Day-Night Sound Levels, L_{dn}	C-6

LIST OF ABBREVIATIONS AND ACRONYMS

AAFES	Army Air Force Exchange Service
ABC	Air Base Group
ACHP	Advisory Council on Historic Preservation
AFB	Air Force Base
AFR	Air Force Regulation
AICUZ	Air Installation Compatible Use Zone
APZ	Accident Potential Zone
ATC	Air Training Command
BACT	Best Available Control Technology
BAFB	Beale Air Force Base
BASH	Bird Air Strike Hazard
BEA	Bureau of Economic Analysis
BIDDS	Base Information Digital Distribution System
BOS	Base Operating Support
CAAQS	California Ambient Air Quality Standards
Cal EDD	California Employment Development Department
Cal DOF	California Department of Finance
CAMS	Consolidated Aircraft Maintenance Complex
CARB	California Air Resources Board
CBPO	Consolidated Base Personnel Office
CCSCE	Center For Continuing Study of the California Economy
CDFG	California Department of Fish and Game
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CLUP	Comprehensive Land Use Plan
CO	Carbon Monoxide
COE	U.S. Army Corps of Engineers
COMBS	Contractor Operated/Managed Base Supply
CRWQCB	California Regional Water Quality Control Board

LIST OF ABBREVIATIONS AND ACRONYMS (cont'd)

cy	Cubic Yard
CZ	Clear Zone
dB	Decibel
DOD	Department of Defense
EA	Environmental Assessment
EIFS	Economic Impact Forecast System
EIR	Economic Impact Region
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ERIS	Economic Resource Impact Statement
EWO	Electronics Weapons Officer
FAA	Federal Aviation Administration
FTW	Flying Training Wing
FY	Fiscal Year
gpm	Gallons per minute
HQ SAC	Headquarters Strategic Air Command
HUD	U.S. Department of Housing and Urban Development
IRP	Installation Restoration Program
kV	Kilovolts
L_{dn}	Average Day-Night Sound Level
MES	Management Engineering Squadron
MET	Management Engineering Team
mg/l	Milligrams per Liter
mgd	Million Gallons Per Day
MOA	Military Operating Areas
MSA	Metropolitan Statistical Area
MUTCD	Manual On Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NCO	Non-Commissioned Officer
NEPA	National Environmental Policy Act of 1969

LIST OF ABBREVIATIONS AND ACRONYMS (cont'd)

NO ₂	Nitrogen Dioxide
NOI	Notice of Intent
NO _x	Oxides Of Nitrogen
NPDES	National Pollution Discharge Elimination System
NZ	Noise Zones
O ₃	Ozone
PAT	Planning Assistance Team
PAVE PAWS	Precision Acquisition Vehicle Entry Phased Array Warning System
PCB	Polychlorinated Biphenyls
PM ₁₀	10-Micron Particulate Matter or Less
SAC	Strategic Air Command
SACOG	Sacramento Area Council of Governments
SARA	Superfund Amendments and Reauthorization Act
SCS	Soil Conservation Service
SEL	Sound Exposure Level
SHPO	State Historic Preservation Officer
SID	Standard Instrument Departures
SO ₂	Sulfur Dioxide
SRW	Strategic Reconnaissance Wing
STP	Sewage Treatment Plant
SV	Services Squadron
SUNT	Specialized Undergraduate Navigation Training
TCE	Trichloroethylene
TDS	Total Dissolved Solids
ug/m ³	Micrograms per Cubic Meter
USAF	United States Air Force
USDA	United States Department of Agriculture
UST	Underground Storage Tank

EXECUTIVE SUMMARY

The action evaluated in this Environmental Impact Statement (EIS) is the realignment of Beale Air Force Base (AFB), California. The realignment is the result of the recommendations of the Defense Secretary's Commission on Base Realignment and Closure, legislative requirements in the Base Closure and Realignment Act, and U.S. Air Force (USAF) plans to enhance mission readiness and national security. The realignment involves the relocation of the 323rd Flying Training Wing--the Specialized Undergraduate Navigation Training (SUNT)--currently operating out of Mather AFB near Sacramento, California, to nearby Beale AFB. The SUNT includes 14 T-43 and 25 T-37 aircraft, 486 military personnel, 307 full-time civilians, and a daily average of 773 students. Additionally, a few tenant organizations with small numbers of personnel currently located at Mather AFB will relocate to Beale AFB as part of the realignment.

The Commission determined that this realignment will be facilitated by an unrelated and previously programmed force structure action to deactivate the SR-71 program at Beale AFB. The deactivation of the SR-71 program has been the subject of a separate National Environmental Policy Act (NEPA) document; however, the cumulative assessment of the force structure change is addressed in this EIS.

Beale AFB will experience construction of approximately 1.7 million square feet of floor area in various types of new facilities over the next 3 years to accommodate the realignment. In addition, several existing buildings will be demolished and/or renovated. Flight operations at Beale AFB will increase by approximately 34 percent as the 323rd Flying Training Wing (FTW) activity is added to existing operations.

Provisions of the Base Closure and Realignment Act preclude the examination of any alternative actions to realignment, but allow for the examination of alternative methods of implementing the realignment. Because the act requires implementation of the realignment to occur at Beale AFB, the "no action" alternative, as well as the alternative to relocate the SUNT to a base other than Beale AFB, has not been evaluated.

The following areas of environmental concern were identified during the scoping process: geology and topography; air quality; water resources; biological resources; archaeology; noise; land use; transportation; utilities; waste management; and socioeconomics. For these areas of concern, potential environmental consequences associated with realignment are described and, as applicable, mitigation measures are recommended.

Geology and Topography. Potential geologic and topographic impacts could include earthquake-induced strong groundmotion, liquefaction, settlement or expansion of soils, erosion, and construction-induced terrain modification. Potential mitigation measures to reduce impacts to insignificant levels include the design and construction of facilities to withstand strong groundmotion and site-specific geotechnical investigations. Measures proposed include dissipation and direction of runoff,

soils, erosion, and construction-induced terrain modification. Potential mitigation measures to reduce impacts to insignificant levels include the design and construction of facilities to withstand strong groundmotion and site-specific geotechnical investigations. Measures proposed include dissipation and direction of runoff, revegetation of disturbed areas, limitation of grading activities, and balancing of cut and fill volumes.

Air Quality. Existing air quality may be affected by both construction and operational activities. Construction impacts are anticipated to be short-term and localized, whereas operational activities will be long-term. Construction emissions will primarily be associated with exhaust and dust generated by heavy equipment. These short-term impacts will be minimized by the proposed suppressing of dust during high wind conditions. Additionally, potential measures including minimizing overlap of activities and subsequent overlap in peak short-term emissions; installation of vapor recovery systems on gasoline-powered construction equipment; curtailment of activity during periods of high ozone conditions; paving high-use haul routes; and covering stockpiles may be taken.

Operation emissions will be generated from aircraft emissions; aircraft refueling; aircraft maintenance; motor vehicles; building maintenance; and automotive refueling. However, it is anticipated that impacts resulting from SUNT operations will not be significant with respect to regional air quality, because SUNT operations will occur within the same air basin as they did at Mather AFB; therefore, they do not represent a new source of air emissions into the air basin. Local air quality at Beale AFB will be impacted by increased emissions. Potential mitigation measures to reduce operational air emissions include encouragement of car and van pooling and bus transportation, and use of state-of-the-art natural gas boilers at new facilities.

Water Resources. Surface water quality on base is not anticipated to be adversely affected by the realignment. Likewise, increased water demand as a result of the realignment is not expected to significantly affect existing water table levels, alter the direction of groundwater flow, or affect other groundwater users in the area. Flooding and/or erosion impacts could occur, although their potential is considered very low. To reduce the potential for flooding and erosion impacts, it is proposed that site grading activities be minimized during the rainy months and that all site preparation activities incorporate best available storm water management practices.

Biological Resources. Although the realignment will primarily disturb introduced annual grassland, other habitats, including vernal pools and other wetlands and riparian habitats, may be affected. Consultation with the U.S. Army Corps of Engineers (COE) will be undertaken in regards to their wetlands permit authority. Proposed mitigation measures to lessen potential impacts will include minimizing the areas to be graded; exclusion of construction-related activity from sensitive wetland and riparian habitat areas; protection of wetlands with silt curtain/fence material; landscaping to reestablish vegetation in disturbed areas with use of native species; and

Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP).

Noise. Noise levels will increase very slightly over existing levels after the SUNT begins operating at Beale AFB. An increase of approximately 2 percent in land area (750 acres) exposed to noise levels in excess of an average day-night sound level (L_{dn}) of 65 is projected. It is proposed that night flight activity be minimized to the extent practical.

Land Uses. Existing land uses in the vicinity of Beale AFB will not be significantly impacted by the realignment. Although an approximate 750-acre expansion of the 65 L_{dn} contour is projected to occur as a result of additional flight activity, this additional acreage predominantly consists of agricultural uses. As a result, no mitigation measures are proposed.

Transportation. The realignment will create additional peak period round trips to and from the base, resulting in impacts on base access, intersections, and parking lots. An additional 671 additional trips are expected during weekday peak periods. A number of specific improvements to the on-base road system, parking lots, and gates, as well as encouragement of alternatives to single-occupant automobile trips, are potential measures to mitigate impacts to transportation.

Utilities. Increases in electricity and water demand, and communication needs will occur as a result of the addition of the SUNT to Beale AFB. However, the increase in electricity demand is not expected to present a significant impact because there are ample power supply and distribution systems on base. Water capacity on base is adequate to meet projected demands associated with increased base personnel. However, portions of the water distribution system will have to be upgraded in order to adequately provide water to one portion of the base. In addition, existing water treatment will have to be upgraded to mitigate high mineral levels during periods of peak demand. Impacts to water distribution are proposed to be mitigated by replacing a deteriorating 18-inch supply line from the on-base well field with a new, larger 20-inch line and by installing a second supply line to the flightline area and additional pumps to the housing area. A potential mitigation measure for the treatment system is the addition of facilities to reduce high mineral levels. No impact to on-base communication systems is anticipated.

Waste Management. Waste management issues were evaluated regarding potential impacts to solid waste disposal, wastewater disposal, hazardous waste generation and disposal, underground storage tanks (USTs), and asbestos. Solid waste and wastewater disposal are not anticipated to present significant impacts to existing landfill and sewage treatment facilities. Potentially, the wastewater system may be improved by additional backup lift pumps at one location and by using a storm water management program. Hazardous waste generation will be limited to small amounts associated with the operation and maintenance of SUNT aircraft and are not anticipated to present significant impacts related to storage and disposal. Several abandoned USTs may exist in areas where SUNT facilities will be built. Portions of these areas have been surveyed to determine potential UST locations; however, results have not been confirmed by excavation. In areas where the potential for USTs exist, it is proposed

that additional geophysical surveys and excavations be conducted to confirm their presence and location. Several of the buildings slated for demolition or modification may contain asbestos in various forms. To confirm the presence of asbestos, it is proposed that detailed surveys be conducted prior to demolition or modification. If asbestos is confirmed, appropriate remedial actions will be implemented.

Socioeconomics. The realignment of Beale AFB will bring additional people and revenue to the region around the base. The local economy will receive most of the estimated \$72 million per year in increased base operating expenditures. The regional impact of this spending is projected to be about \$97 million per year. Of this, about \$48 million per year would accrue to regional households as personal income. Local government revenues and expenditures are also projected to increase. These beneficial economic impacts are small in the regional context.

The number of personnel and their dependents moving to Beale AFB is expected to be 3,435. Induced population growth would bring the total addition to local population to 4,100 persons. Construction activity will create short-term employment for up to 800 workers, and indirect regional employment--attributable to construction of realignment facilities--will amount to about 3,465 person-years during FY 91 through FY 93. Long-term employment gains supported by realignment will average 2,200 jobs. These population and employment impacts do not significantly affect current regional trends and are generally beneficial.

The 829 permanent party personnel are expected to relocate to the area around Beale AFB. An adequate housing supply exists to accommodate these households. Additionally, 450 to 475 school-age children of SUNT personnel are expected to enter area schools after the realignment. Nearly all of these children are expected to attend Wheatland schools, which currently have substantial excess capacity. Education impact assistance to schools is projected to increase by between \$652,600 and \$688,850 per year. The sufficient capacity and additional impact assistance renders the impact of the realignment on schools insignificant. Impacts to other types of community services are not expected to be significant.

1.0 DESCRIPTION OF AND NEED FOR THE REALIGNMENT ACTION

1.1 INTRODUCTION

The Defense Secretary's Commission on Base Realignment and Closure (Commission) was chartered on May 3, 1988, by the Secretary of Defense to recommend realignment and closure of military installations within the United States, its commonwealths, territories, and possessions. Subsequently, the Base Closure and Realignment Act (Public Law 100-526, October 24, 1988) endorsed the Secretary's Commission and required the Secretary of Defense to implement its recommendations unless he rejected them in their entirety or the Congress passed (and the President signed) a Joint Resolution disapproving the Commission's recommendations.

The primary criterion used by the Commission for identifying candidate bases was the military value of the installation. However, cost savings were also considered, as were the current and projected plans and requirements for each military service. Last, the Commission focused its review on military properties and their uses, not military units or organizational/administrative issues.

On December 29, 1988, the Commission recommended the realignment and closure of 145 military installations. Of this number, 86 are to be completely closed, 5 are to be closed in part, and 54 will experience a change (either an increase or decrease in units and activities) as units and activities are relocated.

On January 8, 1989, the Secretary of Defense approved those recommendations and announced that the Department of Defense (DOD) would implement them. The Congress did not pass a Joint Resolution disapproving the recommendations within the time allotted by the Base Closure and Realignment Act.

Therefore, the Act now requires the Secretary of Defense, as a matter of law, to implement those closures and realignments. Implementation must be initiated by September 30, 1991, and must be completed no later than September 30, 1995. Thus, the decision has been made to realign Beale Air Force Base (AFB), California.

The realignment involves the relocation of the 323rd Flying Training Wing (FTW)--the Specialized Undergraduate Navigation Training (SUNT)--currently operating out of Mather AFB near Sacramento, California, to nearby Beale AFB. The SUNT includes 14 T-43 and 25 T-37 aircraft, 486 military personnel, and 307 full-time civilians. Approximately 1,100 students enter SUNT each year with approximately 950 graduating annually. An average of 773 students are involved with SUNT-related activities on a daily basis. The withdrawal of the SUNT and the closure of Mather AFB is the subject of a separate National Environmental Policy Act of 1969 (NEPA) document.

It was determined by the Commission that this realignment will take advantage of an unrelated and previously programmed force structure action to deactivate the SR-71 program at Beale AFB and improve multiservice training by using existing facilities at Beale and consolidating similar activities. The unrelated and previously

planned deactivation of the SR-71 program has been the subject of a separate NEPA document; however, the cumulative assessment of the force structure change is addressed in this Environmental Impact Statement (EIS).

The Base Closure and Realignment Act requires the implementing actions to conform to the provisions of NEPA, as implemented by the President's Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508). In addition, this EIS also follows Air Force regulations (AFR) 19-2, which incorporate both NEPA and the CEQ regulations within the Air Force system. However, the Base Closure and Realignment Act also modifies NEPA to the extent that the environmental analysis need not consider:

- The need for closing or realigning a military installation selected for closure or realignment by the Commission.
- The need for transferring functions to another military installation that has been selected as the receiving installation.
- Alternative military installations to those selected.

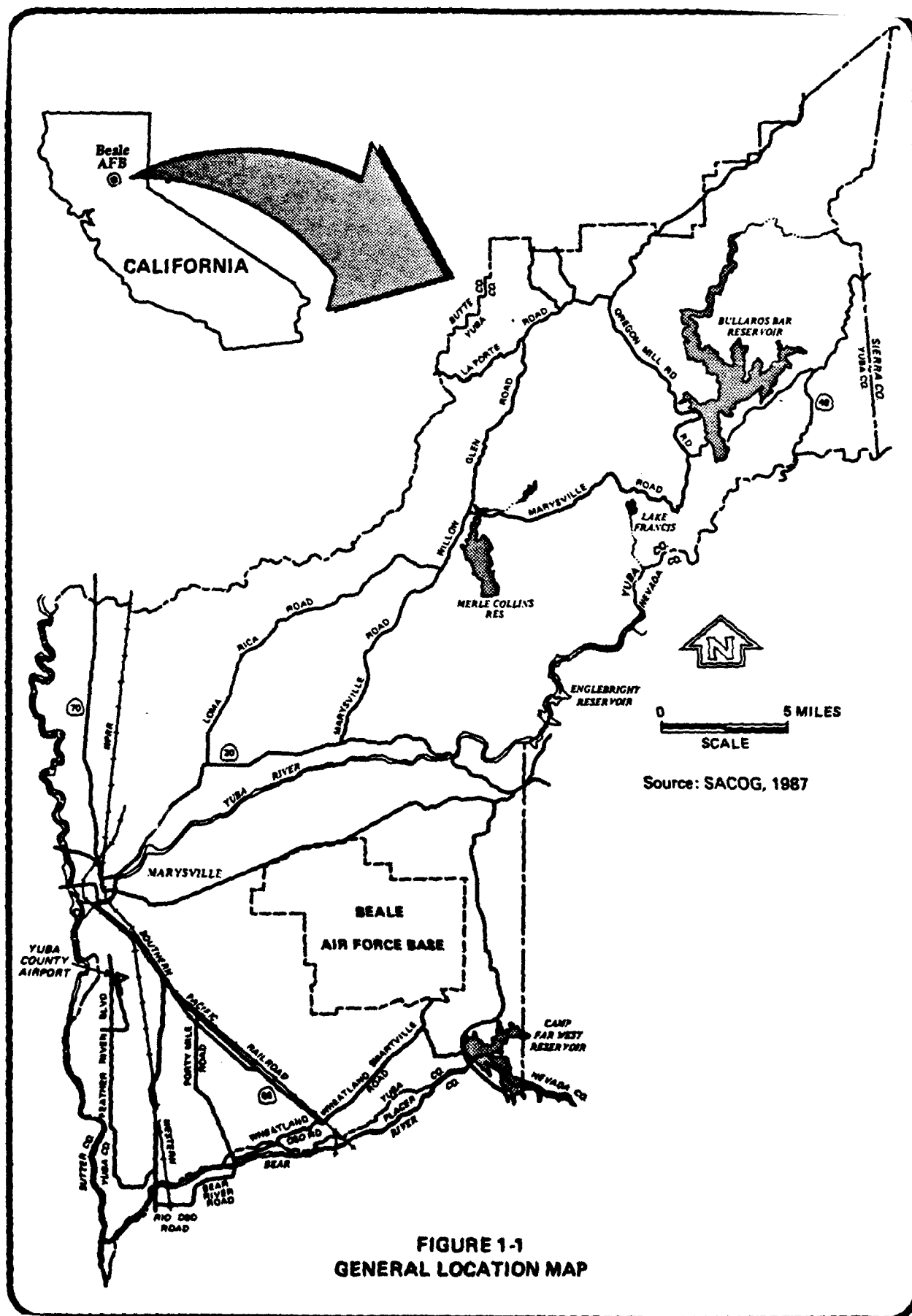
1.2 LOCATION OF BEALE AFB

Beale AFB currently consists of 22,944 acres of government-owned land in Yuba County, approximately 40 miles north of the city of Sacramento and 13 miles east of Marysville, in north-central California (Figure 1-1). The foothills of the Sierra Nevada mountains border the eastern edge of the base. Large water sources that border the base include the Yuba River to the north, the Bear River to the south, and Camp Far West Reservoir to the southeast. Other neighboring cities are Yuba City, 16 miles west; Oroville, 40 miles north; and Grass Valley, 25 miles east.

1.3 SCOPING SUMMARY AND PREPLANNING ANALYSIS

The United States Air Force (USAF) published a Notice of Intent (NOI) in the Federal Register on February 8, 1989, to prepare an EIS for the realignment of Beale AFB. In accordance with the information presented in the NOI, the USAF held a public scoping meeting on February 15, 1989, at the Marysville Chamber of Commerce building. The purpose of this public meeting was to obtain input from the general public and Federal, State, and local agency personnel to assist the USAF in determining the nature, extent, and scope of significant issues related to the realignment action.

The public scoping meeting was attended by approximately 34 persons, including various military personnel, the local news media (four local television stations, a local radio station, and a local newspaper), and a few local citizens. No written or oral comments or concerns were presented by anyone in attendance. However, the general public and agency officials were allowed until March 15, 1989, as stated in the NOI, to submit written comments on issues to be addressed in the EIS.



The USAF received four letters from various State and Federal agencies expressing issues and concerns about the realignment action. Based on the information presented in these letters, significant issues that relate to the realignment action include the following:

- Potential impacts to wetland and vernal pool areas.
- Increased demand on existing wastewater treatment plant capacities.
- Potential impact to known areas of past contamination on base and to current or increased hazardous waste generation, use, and disposal management.
- Potential impacts to air quality.
- Potential increases in noise.
- Potential impacts to surface water quality.
- Potential impacts to protected plant and/or animal species.
- Potential impacts to migratory deer herds.
- Potential impacts to salmon spawning areas in Dry Creek/Best Slough.

It should be noted that, at the time the scoping process was being conducted, the USAF was proposing that a new parallel runway adjacent to the existing runway at Beale AFB be constructed as part of the realignment action. Subsequent to the public scoping process, the Air Force Council disapproved the construction of this second runway. Therefore, Federal and State agency concerns expressed in their letters that address potential impacts related to construction of an additional runway as part of the realignment action are no longer relevant. However, a Parasail area for parachute training, consisting of a 3,000 foot diameter circular road crossed by several paved intersecting roadways has been added to the realignment action since the completion of the scoping process. Concerns related to the additional runway pertaining to potential impacts on biological resources are generally applicable to this training facility.

The results of the scoping process have identified several issues to be addressed as part of the environmental impact analysis. In addition to those issues identified by State and Federal agencies, the following issues will be addressed in this EIS: geologic environment; water supply; zoning and political boundaries; archaeological, cultural, and historic resources; transportation; utilities and waste management; and socioeconomic issues including employment, household income, housing, education, and community service facilities.

**1.4 RELEVANT FEDERAL, STATE, AND LOCAL STATUTES, REGULATIONS,
AND GUIDELINES**

A summary of governmental actions including laws, regulations, executive orders (EO), and other types of actions imposing requirements relevant to the SUNT realignment action is presented in Table 1-1.

TABLE I-1
Summary of Relevant Federal, State, and Local Statutes,
Regulations, and Guidelines

<u>Statutes and Executive Orders</u>	<u>Implementing Regulations</u>	<u>Description</u>
I. Air		
Clean Air Act	40 CFR 50-52 California Health & Safety Code, Division 26	Provides the framework for air pollution control. Local air pollution control agencies enforce prohibitory rules and conduct new source review for permits. The Act requires states to develop state implementation plans so that nonattainment areas can meet national ambient air quality standards. Ambient air quality standards for several pollutants found in the atmosphere are established. Ambient standards allow classification of regional air quality for six criteria pollutants.
Yuba County Air Pollution Control District	Rules & Regulations Regulation IV	Provides standards under which Authority to Construct and Permits to Operate can be issued. New stationary sources must comply with requirements of Best Available Control Technology (BACT) if emission thresholds are to be exceeded.
Yuba County Air Pollution Control District	Rules & Regulations Regulation III	Provides prohibitory rules for stationary sources. Specific rules cover dust and fume generation, gasoline loading operations, architectural coatings, and solvent degreasing.

TABLE 1-1 (cont'd)

<u>Statutes and Executive Orders</u>	<u>Implementing Regulations</u>	<u>Description</u>
2. Biological Resources EO11990, Protection of Wetlands		<p>Establishes a Federal policy to protect Federally-owned or -controlled wetlands by requiring that all Federal agencies avoid "undertaking or providing assistance for new construction located in wetlands."</p>
Endangered Species Act of 1973 (Public Law 93-205)	50 CFR 10-14, 17, and 81	<p>Identifies and protects species threatened or in danger of extinction. As part of this effort, the habitat of threatened or endangered species are protected. Harm to a listed species or its habitat, known as a taking, is forbidden. It is possible for the administering agency, the U.S. Fish and Wildlife Service, to allow a limited taking in instances of extreme economic hardship.</p>
3. Cultural Resources National Historic Preservation Act (Public Law 89-665)	36 CFR 800-805	<p>Requires that prior to Federal action, account is taken of the effects of the action on properties included in or eligible for the National Register of Historic Places. Measures to minimize harm to any National Historic Landmark that may be affected by the action are mandated. State and local governments, private individuals, Native American Organizations, and the Advisory Council on Historic Preservation (ACHP) may become involved as consulting parties in the implementation of the Act.</p>

TABLE 1-1 (cont'd)

<u>Statutes and Executive Orders</u>	<u>Implementing Regulations</u>	<u>Description</u>
Archaeological Resources Protection Act (Public Law 96-95)	36 CFR 296	Regulates archaeological work on Federal lands with the goal of preventing unauthorized disturbance of archaeological resources. Permits can be obtained to conduct such work.
4. Environmental Policy		
National Environmental Policy Act (NEPA, Public Law No. 91-190).	40 CFR 1500-1508 Air Force Regulations 19-2	NEPA procedures ensure that environmental information is available to public officials and citizens before decisions are made and actions taken on Federally funded projects. The NEPA process, which can include preparation of an Environmental Assessment or Environmental Impact Statement, is intended to help public officials make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment.
EO11514, Protection and Enhancement of Environmental Quality, as amended by EO11991		These EOs are the President's statement accepting the policy set out in NEPA and giving direction to Federal agencies and the Council on Environmental Quality for their responsibilities in carrying out this policy.
5. Land Use		
EO12372, Intergovernmental Review of Federal Programs		Directs that "Federal agencies shall provide opportunities for consultation" by state and local government officials on Federal projects.

TABLE 1-1 (cont'd)

<u>Statutes and Executive Orders</u>	<u>Implementing Regulations</u>	<u>Description</u>
Air Installation Compatible Use Zone (AICUZ) Program	Air Force Regulations 19-3	This Air Force program provides guidance to local governments in developing land use policies. A document is prepared for each installation describing noise conditions and safety zones on and near the installation. The Air Force has no authority to impose land use restrictions on local agencies or landowners.
California Airport Land Use Commission Law	Article 3-5 California Public Utility Code	Directs local governments to establish Airport Land Use Commissions to develop Comprehensive Land Use Plans (CLUP) for each airport or military air installation. This program is designed to ensure the orderly expansion of airports and airfields and the adoption of land use measures that minimize the public's exposure to excessive noise and safety hazards. Local governments use the CLUP, which incorporates information from the AICUZ program, to make decisions under their zoning authority.
6. Public Health and Safety Resource Conservation and Recovery Act of 1976 (RCRA, Public Law 94-533)	40 CFR 240-280	Establishes Federal programs governing solid and hazardous waste. For solid waste, disposal requirements to end open dumping practices and protect water supplies are promulgated. Extensive regulation of hazardous waste handling, transportation, and disposal covers all hazardous waste activities from the point of generation through transportation to final disposition, which includes recycling, destruction, or disposal. An additional program under RCRA regulates underground storage tanks.

TABLE 1-1 (cont'd)

Statutes and Executive Orders	Implementing Regulations	Description
EO12088, Federal Compliance with Pollution Control Standards		States that all executive agencies (such as the Department of Defense) must comply with all applicable pollution control standards. Heads of agencies are responsible for ensuring that "all necessary actions are taken for the prevention, control, and abatement" of pollution and are required to submit annual pollution control plans.
7. Water		
Safe Drinking Water Act (Public Law 93-523 and 96-339)	40 CFR 141-149	Protects the quality of water supplied by public drinking water systems (over a minimum size). Maximum Contaminant Levels (MCL) have been established for many contaminants which may not be exceeded in public drinking water supplies. Maximum Contaminant Level Goals (MCLG) are non-binding guidelines for contaminants in such supplies. Establishes programs to protect underground drinking water sources from contamination.
Federal Water Pollution Control Act (Public Law 92-500) and Clean Water Act (Public Law 97-117 and 100-4)	40 CFR 100-140, 40 CFR 400-471, and 33 CFR 320-330	Require that discharges to surface waters be permitted and controlled under the National Pollution Discharge Elimination System (NPDES). Minimum national standards for numerous pollutants and testing requirements are established. In California, the NPDES is administered by each Regional Water Quality Control Board. Wastewater discharged to publicly-owned treatment works may be subjected to pretreatment requirements. Section 404 (Clean Water Act) gives the Army Corps of Engineers authority to control development in waterways including wetlands.

TABLE 1-1 (cont'd)

<u>Statutes and Executive Orders</u>	<u>Implementing Regulations</u>	<u>Description</u>
California Porter-Cologne Water Quality Act of 1969	California Regulations Title 23 Chapter 3 Section 2050-2836	Establishes the California Regional Water Quality Control Boards (CRWQCB), which are charged with attaining "the highest water quality which is reasonable." These boards have authority to develop and implement regional water quality control plans by regulation of water issues and waste discharge.
California Safe Drinking Water and Toxic Enforcement Act of 1986	California Regulations Title 23 Chapter 3 Section 2050-2836	Establishes a blanket prohibition on "contaminating drinking water with chemicals known to cause cancer or reproductive toxicity." A list of such chemicals is required to be published by the Governor.

2.0 ALTERNATIVES INCLUDING THE REALIGNMENT ACTION

2.1 INTRODUCTION

The Base Closure and Realignment Act (Public Law 100-526, 24 October 1988) requires the Secretary of Defense, as a matter of law, to implement the realignment of Beale AFB to include the SUNT mission. The Act requires the implementing actions to conform to the provisions of NEPA. However, the Act also precludes the examination of any alternative actions to realignment. Consequently, this document will only examine alternate methods of carrying out the realignment. Because the Act requires implementation of the realignment, "no action" is not an alternative and is not specifically included. However, Chapter 3 presents the environmental conditions associated with the installation and its operations, which will serve as the baseline against which the implementation impacts are judged.

2.2 DETAILED DESCRIPTION OF THE REALIGNMENT ACTION

2.2.1 Realignment Action

The realignment action involves the addition of the SUNT, currently located at Mather AFB, to Beale AFB. The SUNT consists of six navigator training squadrons and one aircraft maintenance squadron. Approximately 1,100 students (Air Force, Navy, Marine, and foreign national) enter SUNT each year with approximately 950 graduating annually. The average daily student load is approximately 773 persons. In addition to these students, there are also 486 full-time military personnel and 307 full-time civilians associated with SUNT operations, including administrative staff, faculty, aircraft operations and maintenance personnel, and staff of tenant units. Estimates of the numbers of full-time personnel expected to relocate to Beale AFB as a result of the realignment are presented in Table 2-1. In addition to the SUNT personnel, 33 military personnel and 3 civilians under various commands are expected to relocate. No reserve personnel will be affected by the realignment.

Since the Strategic Air Command (SAC) is the host command at Beale AFB, Base Operating Support (BOS) personnel included in the realignment will be reassigned from the Air Training Command (ATC) to SAC. It is estimated that approximately 230 positions of the 829 permanent party expected to relocate will be reassigned, including approximately 90 medical personnel. These 230 positions are expected to bring support units up to required strength to accommodate the addition of the SUNT.

SUNT operations at Beale AFB are expected to become fully operational by the fourth quarter of fiscal year (FY) 1993. Once operational, a complete SUNT in-session training course would last approximately 170 work days per year. Although this represents a 34-week (or an approximate 9-month) period, in-session training courses are continuously scheduled throughout the calendar year; thus, SUNT activities would occur at Beale AFB year round.

TABLE 2-1

Estimates of Full-Time Personnel Affected by Realignment

<u>Unit</u>	<u>Officers</u>	<u>Enlisted</u>	<u>Civilians</u>	<u>Total</u>
323rd FTW (includes the 450th, 451st, 452nd, 453rd, 454th, and 455th Flying Squadrons)	324	31	6	361
Department Operations Staff	49	26	56	131
Wing Headquarters	5	8	7	20
Physiological Training Unit	4	22	0	26
3314th Management Engineering Squadron (MES) Headquarters	1	4	0	5
Wing Commander	7	5	3	15
Aircraft Maintenance, Contractor	<u>0</u>	<u>0</u>	<u>235</u>	<u>235</u>
TOTAL, SUNT personnel	390	96	307	793
Tenant Units ¹	<u>12</u>	<u>21</u>	<u>3</u>	<u>36</u>
TOTAL, Permanent Party	402	117	310	829
Students (average daily load)	<u>723</u>	<u>50²</u>	<u>0</u>	<u>773</u>
TOTAL, Realignment	1,125	167	310	1,602

Source: 323rd FTW, ABG, Mather AFB; February 1990.

Notes: ¹Tenants include Air Force Communications Command, Air Force Commissary Service, Office of Special Investigations, Military Airlift Command, Air Force Legal Services Center, Air Force Audit Agency, Military Personnel Center, Air Force Logistics Command, and Electronics Security Command.

²Approximately 50 Marine students are considered enlisted. All other students are officers.

Flying operations related to SUNT would use Beale AFB for runway, hangar, maintenance, and repair facilities. However, air space necessary for flight training exercises would occupy essentially the same air space these exercises currently occupy operating out of Mather AFB. The T-43 aircraft will continue to use the established low-level training routes--designated IR-207, IR-275, and IR-400. The T-37 aircraft will be assigned new Standard Instrument Departures (SIDs) by the Federal Aviation Administration (FAA). SIDs provide standard routes for the transition of an operation between departure and the enroute phase. Military Operating Areas (MOAs), specific airspace units designated for military training operations, used by the T-37 will not be changed (Personal Communication, HQ SAC, February 1990).

Current flying operations at Mather AFB for the T-43 average 2,673 sorties annually. Operations for the T-37 at Mather AFB average 8,262 sorties annually. These two types of aircraft average 82,800 runway operations each year--20,206 for the T-43 and 62,604 for the T-37. An operation consists of one takeoff, one landing, one low approach, or one touch and go, while a sortie is a complete mission flown by one aircraft that may include a number of operations. For these two types of aircraft, as they are currently operating at Mather AFB, there is an average of 7.5 operations during each sortie (Personal Communication, Captain Byron Wall, Mather AFB, February 1990).

The T-37 aircraft operated by the SUNT program is a two-seat jet trainer designed as such for the Air Force. Manufactured by Cessna, the T-37 has a wing span of over 33 feet, a length of approximately 29 feet, and an overall height of approximately 9 feet. The maximum level speed of a T-37 is 370 knots or 426 miles per hour (mph) and its maximum range is 819 nautical miles or 943 miles. Production of the T-37 ceased in 1977 (Jane's, 1977-78).

The SUNT also operates T-43 aircraft that were manufactured by Boeing as their model number 737-200. These craft, designed as commercial transports, were modified for the Air Force as navigator trainers. Each craft accommodates up to 12 student navigators, four navigator proficiency students, and three instructors. These craft have a wing span of 93 feet, a length of 100 feet, and an overall height of 37 feet. The maximum level speed of the T-43 is 509 knots or 586 mph and its maximum range is 2,200 nautical miles or 2,530 miles. Boeing ceased production of the 737-200 in 1988 (Jane's, 1979-80 and 1989-90).

A force structure action was programmed at Beale AFB prior to the realignment action. This action was the deactivation of SR-71 flying operations and related support functions, which affected 586 military personnel and 38 civilian personnel (HQ SAC, January 1990).

The realignment action and the force structure change will result in changes in the units operating at Beale AFB. The existing units, as of February 8, 1990, are presented below. Units associated with the realignment are presented in Table 3-1.

The 14th Air Division includes:

- The 9th Strategic Reconnaissance Wing (SRW) includes:
 - The 5th Strategic Reconnaissance Training Squadron.
 - The 99th Strategic Reconnaissance Squadron.
 - The 349th Air Refueling Squadron.
 - The 350th Air Refueling Squadron.
 - The 9th Avionics Maintenance Squadron.
 - The 9th Field Maintenance Squadron.
 - The 9th Organizational Maintenance Squadron.
 - The 609th Organizational Maintenance Squadron.
 - The 9th Reconnaissance Technical Squadron.
- The 814th Combat Support Group includes:
 - The 814th Civil Engineering Squadron.
 - The 814th Security Policy Squadron.
 - The 814 Services Squadron.
 - The 814th Mission Support Squadron.
- The 814th Supply Squadron.
- The 814th Transportation Squadron.
- The 814th Comptroller Squadron.

Units that are not part of the 14th Air Division include:

- The 814th Strategic Hospital.
- Detachment 6 of the 3904th Management Engineering Squadron, SAC.
- The 7th Missile Warning Squadron, tenant.
- The 1360th Audiovisual Squadron, tenant.
- Detachment 626 of the 3753rd Field Training Squadron, tenant.
- Detachment 11 of the 9th Weather Squadron, tenant.
- The 1883rd Communication Squadron, tenant.
- The Air Force Commissary Service, tenant.
- The Air Force Legal Services, tenant.
- The Air Force Office of Special Investigations, tenant.

(Source: Captain Mark Plaster, Beale AFB, Det 6, 3904 MES/SAC MET).

The deactivation of the SR-71 program will begin with the loss of one unit from Beale--the 1st Strategic Reconnaissance Squadron. This squadron includes 30 officers,

nine enlisted personnel, and one civilian. Other units of the 9th Strategic Reconnaissance Wing associated with the SR-71 program will also experience personnel reductions. This deactivation has been addressed in a separate Environmental Assessment (EA) (HQ SAC, January 1990).

Changes in flight operations are expected as a result of both the force structure change and the realignment. Table 2-2 presents estimates of average daily operations and projected maximum changes. The projected maximum cumulative average operations per day include an undetermined classified number of T-38 and KC-135 aircraft associated with the deactivation of the SR-71 program.

2.2.2 Construction and Facility Siting Alternatives

Construction of new facilities and upgrading of existing facilities will be required to provide adequate support to implement the realignment action. Based on the construction schedule and operational requirements, Beale AFB will be ready to begin accepting the SUNT in FY 93. All realignment actions are expected to be completed by the end of FY 93.

Planning assistance for the siting of new facilities required as a result of the relocation of the SUNT to Beale AFB was requested by HQ SAC. In response, a Planning Assistance Team (PAT) was organized and managed by the office of the Air Force Regional Civil Engineer, Western Region. The PAT consisted of members representing the following disciplines: airfield planning, aircraft maintenance, architecture, community and environmental planning, and engineering.

The PAT focused attention primarily on facilities identified and required by SAC and ATC. Professional engineering and community planning judgment, guidance and standards established by Air Force directives, expressed local interests, and functional relationships were used to recommend siting for functional complexes and individual facilities. Factors for siting facilities considered by the PAT included the general and specific guidance set forth in AFR 86-4, Base Comprehensive Planning, and other associated directives; the airfield and airspace criteria contained in AFR 86-14; contaminated areas being investigated or remediated in accordance with the Air Force Installation Restoration Program (IRP); quantity-distance zones around explosives storage sites; AICUZ noise zones; an evaluation of existing facilities in the development zones for contribution to or impact on the new functional use of the area, and conversion or removal if required; existing and projected traffic patterns and volumes; operational requirements expressed by the senior staffs at Beale AFB and Mather AFB; and functional relationships.

Complexes, or groups of facilities, were established based on functional relationships between facilities with existing compatible functions and land use zones so that similar functions would be consolidated. Spatial requirements, physical limitations, and environmental concerns were also major considerations. As a result, three complexes were developed--the academic complex, the consolidated aircraft maintenance complex, and the base operating support complex. The base traffic

TABLE 2-2
Aircraft Operations and Expected Changes in
Operations at Beale AFB

<u>Aircraft</u>	<u>Current Average Operations Per Day¹</u>	<u>Projected Changes in Average Operations Per Day</u>	<u>Projecte¹ Maximum Cumulative Average Operations Per Day</u>
SR-71	3	-3	-
T-38	232	- ²	232 ²
KC-135	156	- ²	156 ²
T-37	-	+183 ³	183
T-43	-	+49 ³	49
Others	277	-	77
TOTAL	668	+229	897

¹ Source: USAF, HQ SAC, 1990.

² Some T-38 and KC-135 operations are associated with the SR-71 program; however, the numbers of such operations are classified. Therefore, reductions in T-38 and KC-135 flight are expected, but have not been included in this analysis.

³ Source: USAF Engineering Services Center, Tyndall AFB, Florida.

network and existing facilities that would be consolidated, displaced, and/or relocated to other sites were also evaluated.

Adjustments and refinements to the recommended PAT sitings were made by the base and both Commands to take advantage of consolidation savings and joint use of facilities. The goal was to build the most efficient and cost-effective operation.

The required construction activities are shown in Table 2-3. The programmed cost of each construction project and the budget year in which funding will be provided are also shown in this table. Figures 2-1 through 2-4 show the preferred or selected locations of the facilities; the facilities are referred to on the figures as indicated in the reference key column in Tables 2-4 through 2-6. Table 2-7 presents information about buildings that may be demolished to allow construction of new facilities. These buildings are also shown on Figures 2-1 through 2-4 using the reference key indicated on this table. The alternative sites considered for required complexes are shown on Figure 2-5.

2.2.3 Required Construction and Facilities

Principle components of the realignment action will require construction of new facilities and modifications to existing facilities. Construction will range from FY 90 through FY 93, with the SUNT fully operational at Beale by the fourth quarter of FY 93. The general purpose of each complex or grouping of facilities, with specific concerns and alternatives for siting of these facilities, follows.

2.2.3.1 Consolidated Aircraft Maintenance Complex (CAMS)

The primary facilities needed to accommodate the additional aircraft maintenance functions being relocated to Beale AFB are listed in Table 2-4. The square footage shown in the area column is the footprint or the amount of land area required for each facility.

The facilities planned for the CAMS, listed in Table 2-4, include a two-bay, high-bay maintenance hangar with adjacent apron and ramp for 14 T-43 aircraft. Two single story structures are planned. One would house the Field Maintenance Shop and the other would house both the T-37 and T-43 Squadron Operations, as well as storage space for aircrew and survival equipment. A building is planned for the COMBS warehouse to store spare parts for the T-43 aircraft and will also house the Avionics Shop. A facility for repair of the fuel systems is planned. New roadways for access to and circulation within the CAMS will be required, and utilities will need to be extended to the CAMS location.

Three sites were considered for the CAMS that met the major siting criteria of proximity to the flightline and adequate space for all necessary facilities. One potential site is at the southern end of the runway on the existing SR-71 trim pad, which would require demolition of the trim pad. However, the T-43 requires the use of a trim pad facility for maintenance and, therefore, it was not deemed economically feasible to demolish the existing trim pad when a new use is expected for it.

TABLE 2-3

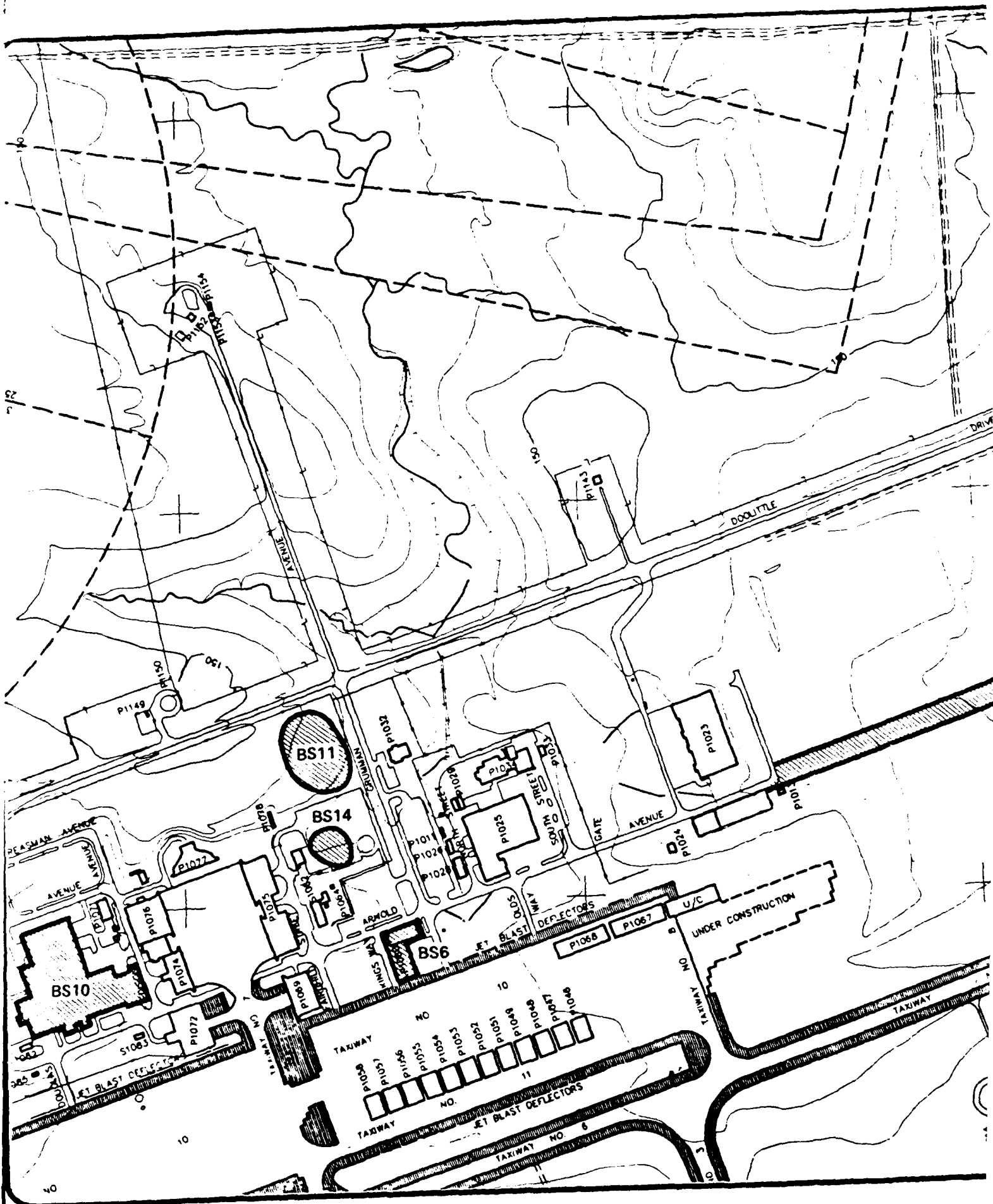
Programmed Project Cost and Budget Year

<u>Project</u>	<u>Programmed Amount (\$ Millions)</u>	<u>Budget Year (Fiscal Year FY)</u>
Flight Simulator Training Electronic Weapons Officer (EWO)	\$8.7	1991
Flight Simulator Training (T-45)	6.6	1991
Wing Headquarters and Operations Staff Facility	3.7	1991
Combined Squadron Operations Facility	5.3	1991
Academic Facility	7.3	1991
Visual Information and Training Aids	3.1	1991
Physiological Training	1.5	1991
Fiscal Year 1991 TOTAL	\$36.2	
Student Officer Dormitory	28.0	1992
Modify Hospital	14.7	1992
Apron Ramp	14.4	1992
Utilities and Roads	1.8	1992
Fuel Systems Maintenance Dock	3.4	1992
Hangar	11.4	1992
Field Maintenance Shop	2.6	1992
Avionics Shop	2.0	1992
Contractor Operated/ Managed Base Supply (COMBS) Warehouse	0.9	1992

TABLE 2-3 (cont'd)

<u>Project</u>	<u>Programmed Amount (\$ Millions)</u>	<u>Budget Year (Fiscal Year FY)</u>
Squadron Operations (T-37)	3.4	1992
Squadron Operations (T-43)	2.5	1992
Transient Lodging Quarters	1.3	1992
Visiting Officers Quarters	1.4	1992
Military Personnel Base Support Center	4.8	1992
Fiscal Year 1992 TOTAL	\$92.6	
In-Flight Kitchen	0.4	1993
Officers Open Mess	6.2	1993
Army Air Force Exchange Service (AAFES) Facilities (Commissary and Shop and Gas)	6.8	1993
Modify Administrative Facility	1.4	1993
Modify Survival Equipment Shop	0.7	1993
Modify Physical Fitness Centers	6.2	1993
Modify Furniture Storage and Communication Facility	0.7	1993
Enlarge Child Development Center	0.9	1993
Refueling Vehicle Parking	0.3	1993
Fiscal Year 1993 TOTAL	\$23.6	
Military Construction: (all years) TOTAL	\$152.4	

Source: HQ SAC DE OFFUTT, 1990.



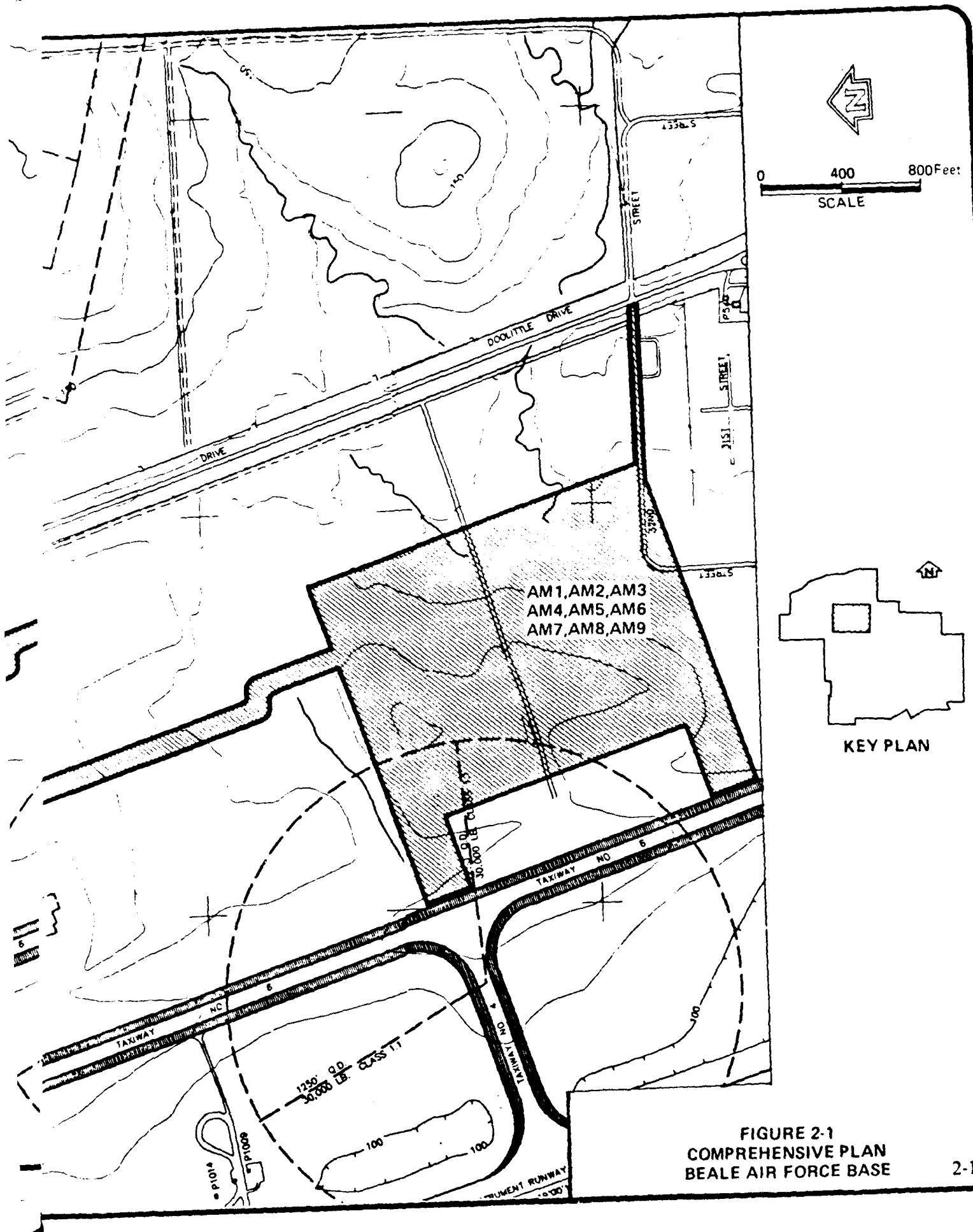
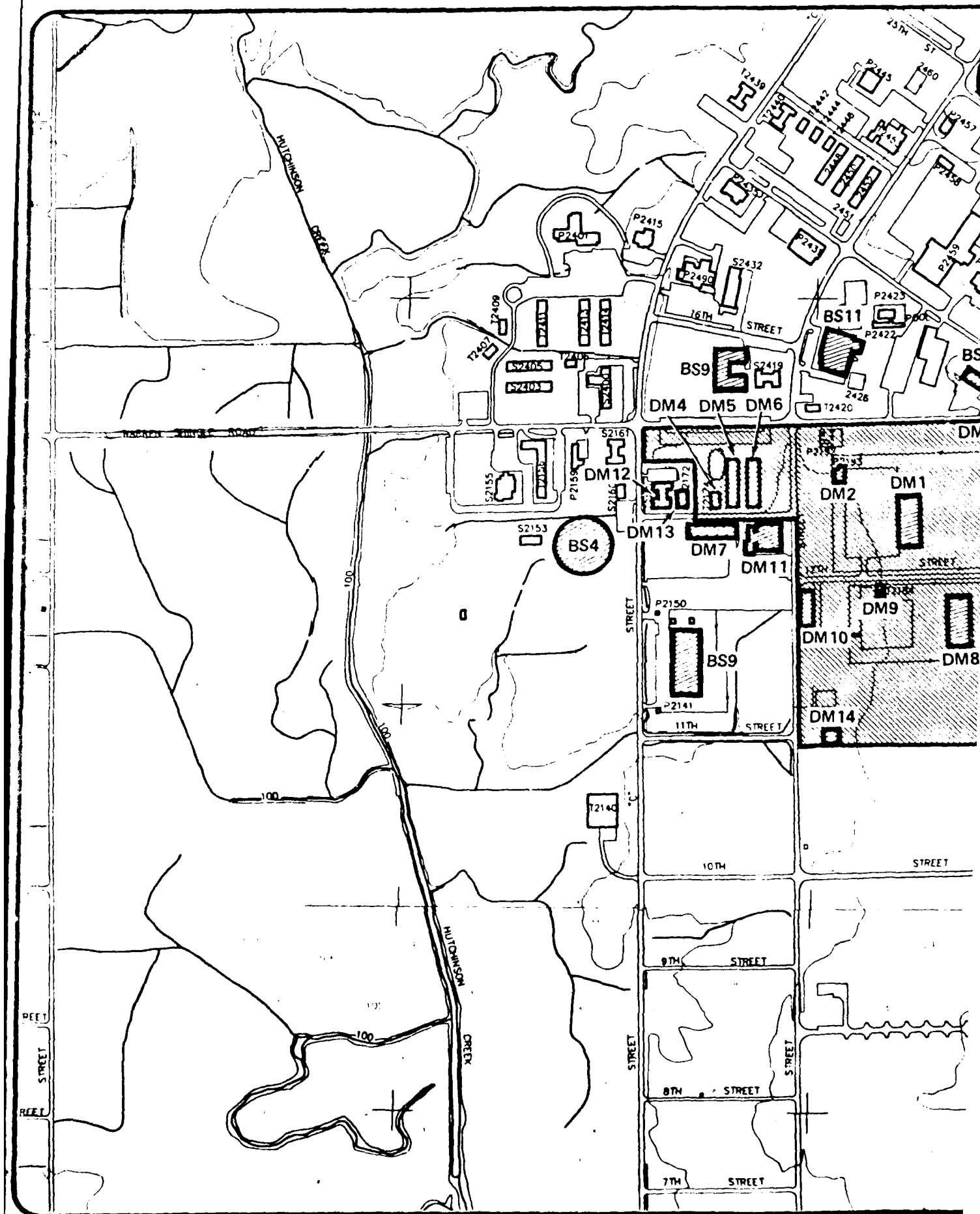
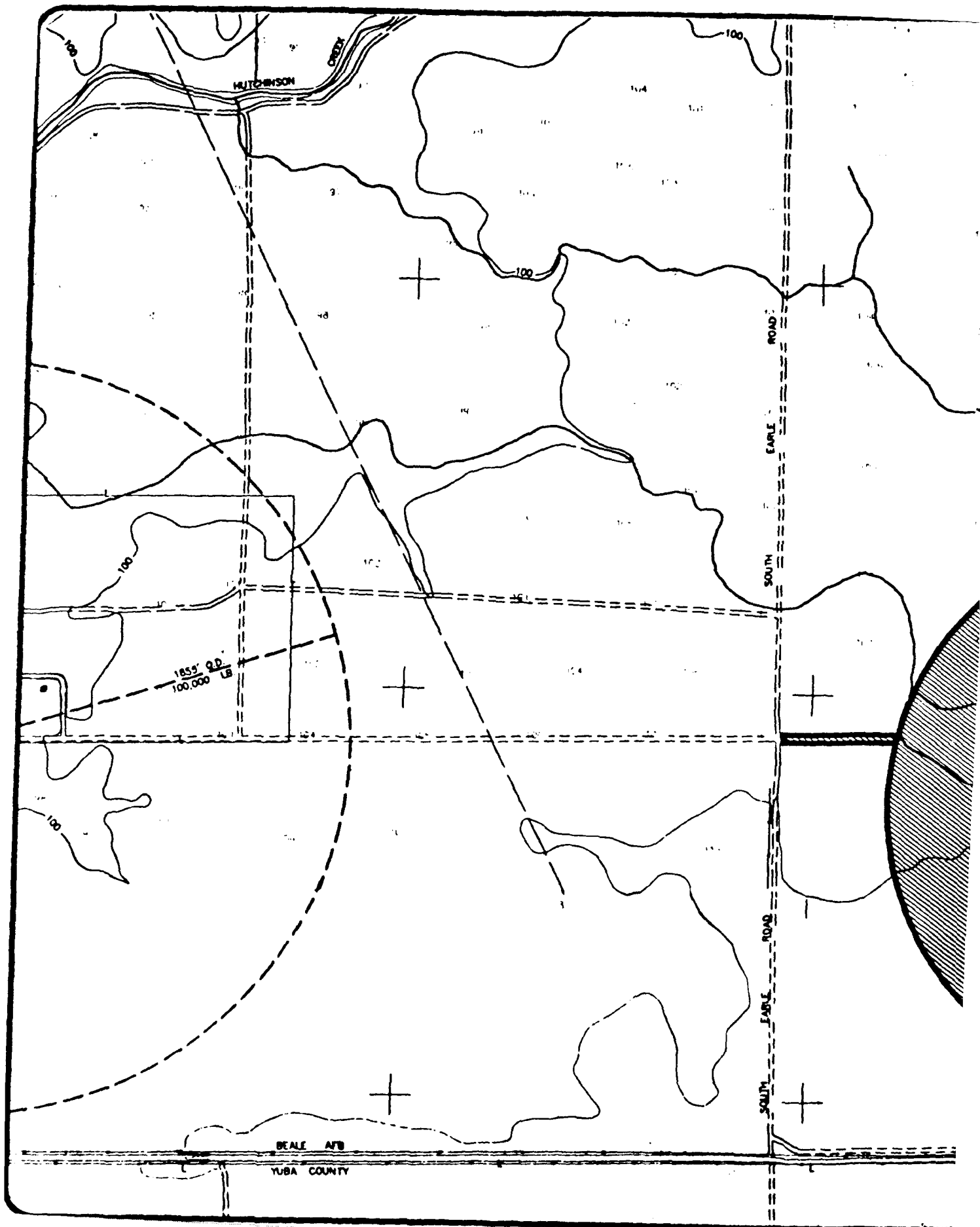


FIGURE 2-1
COMPREHENSIVE PLAN
BEALE AIR FORCE BASE





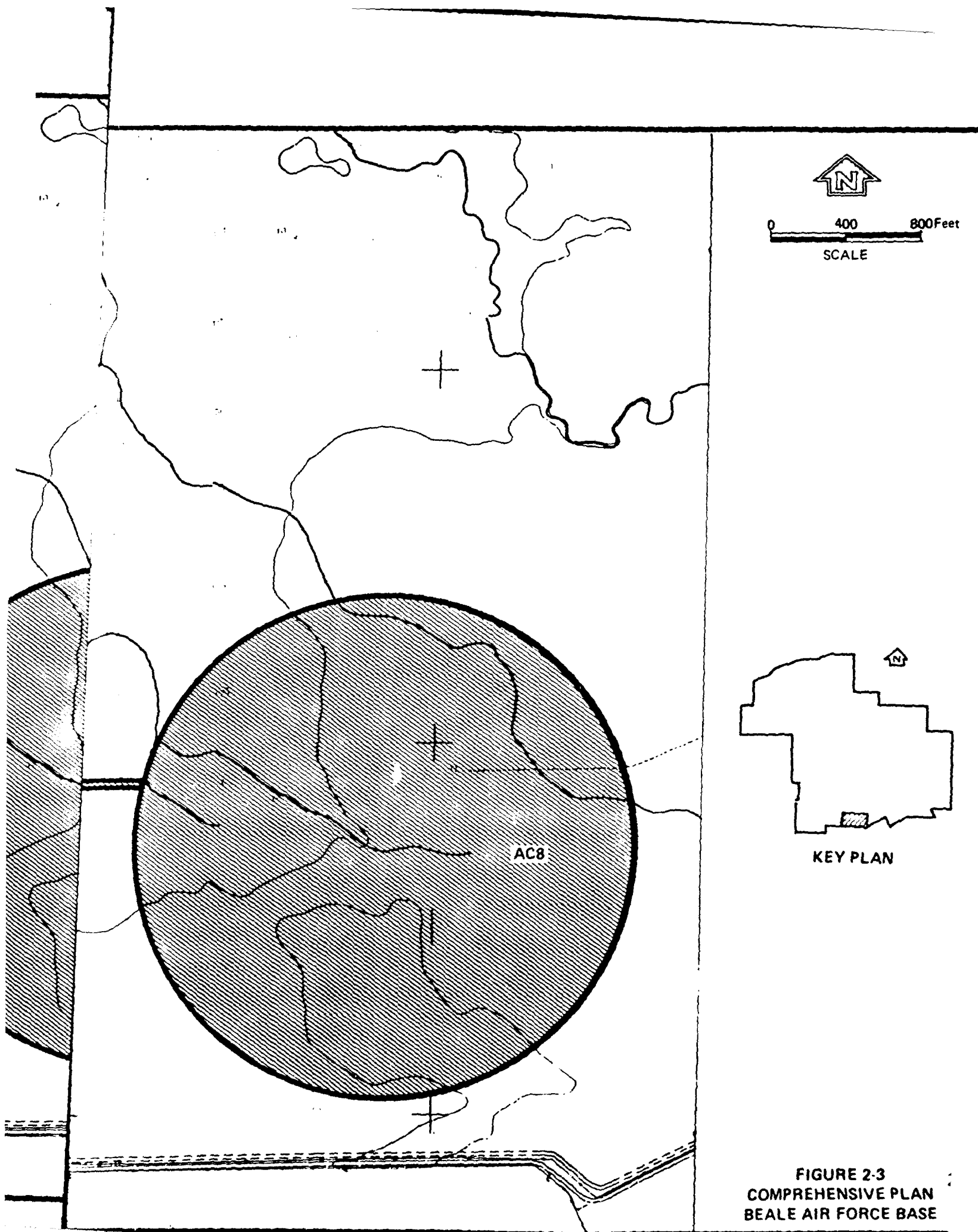
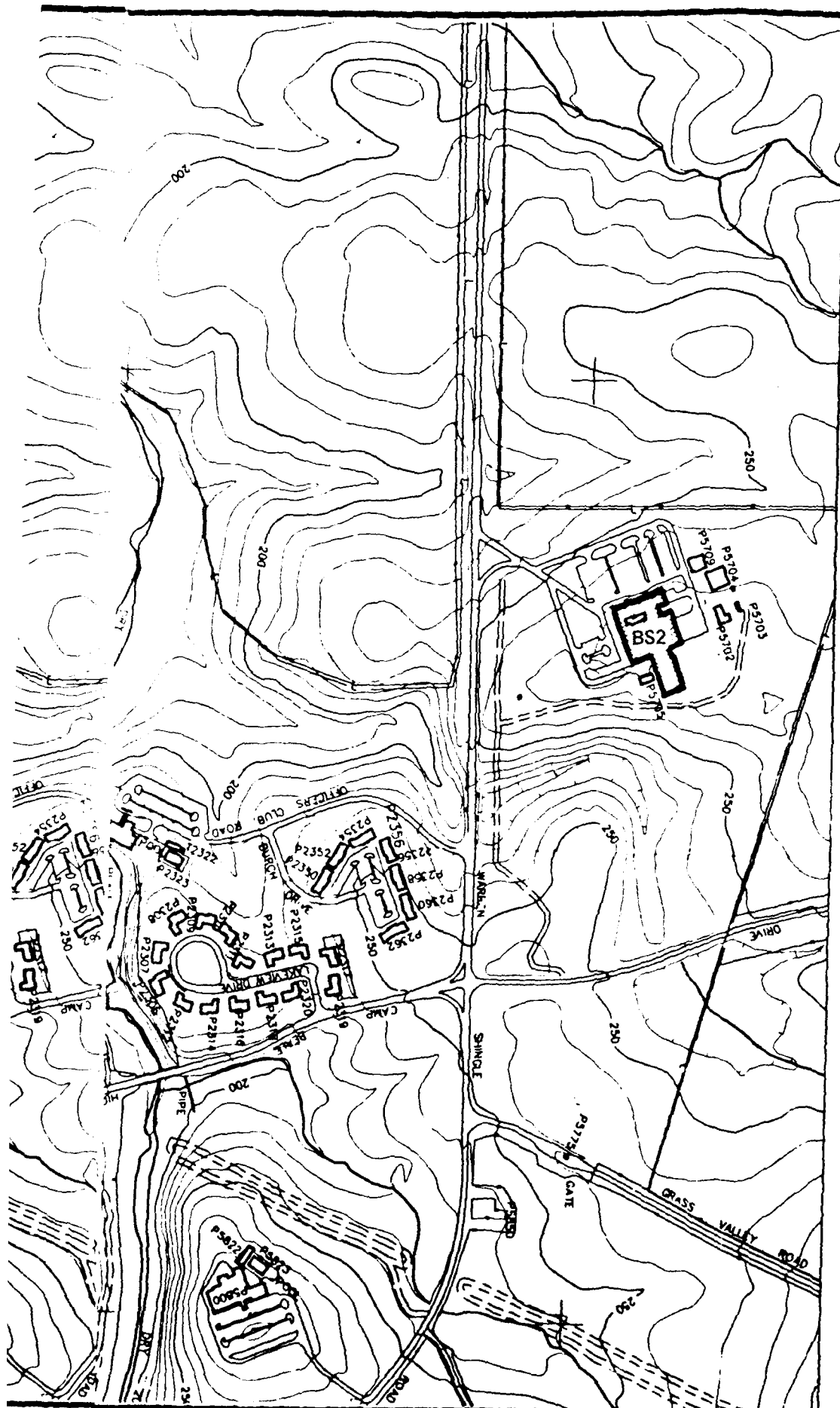


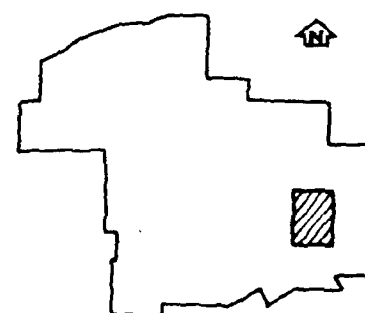
FIGURE 2-3
COMPREHENSIVE PLAN
BEALE AIR FORCE BASE





0 400 800 Feet

SCALE



KEY PLAN

**FIGURE 2-4
COMPREHENSIVE PLAN
BEALE AIR FORCE BASE 2-13**

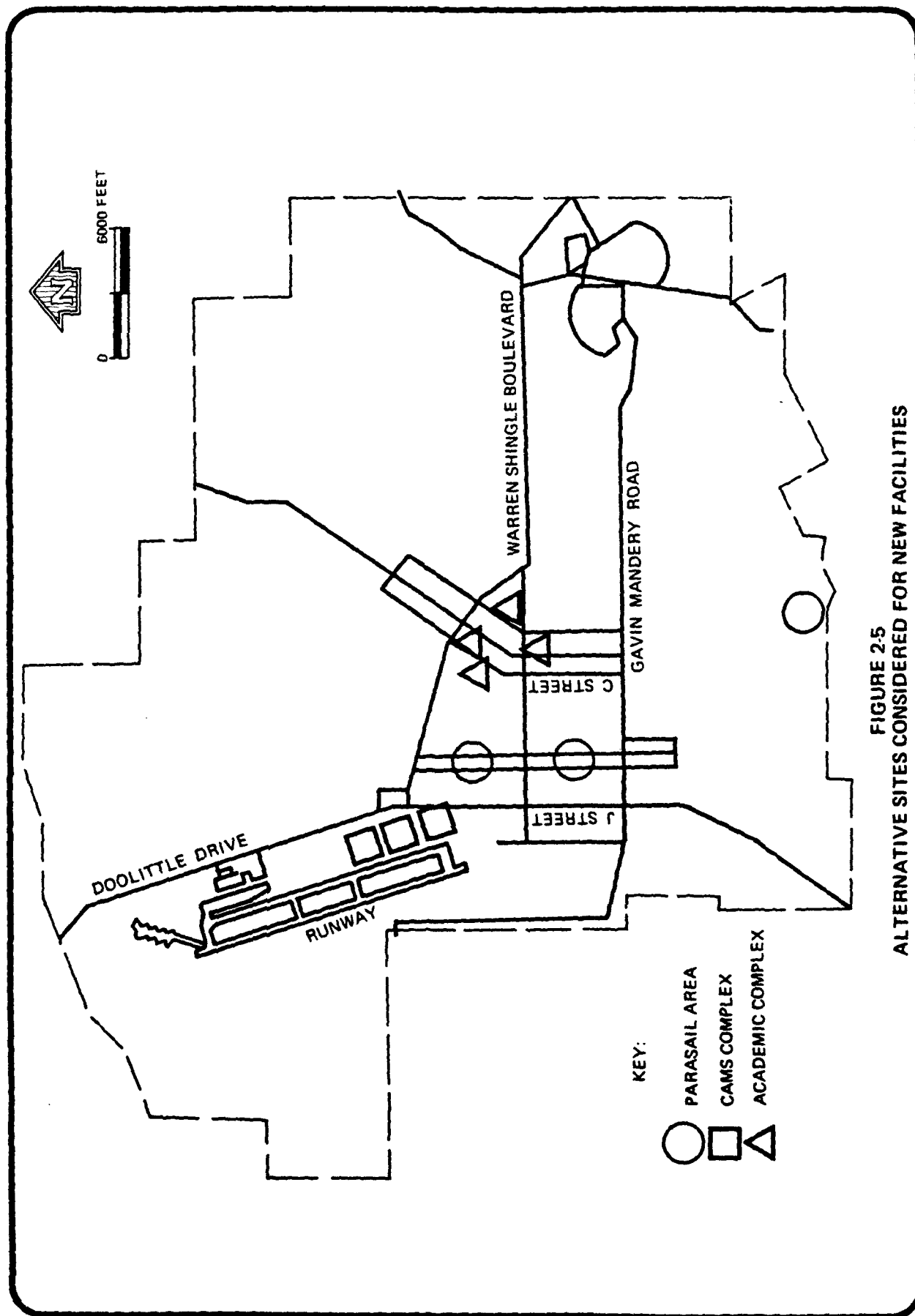


FIGURE 2-5
ALTERNATIVE SITES CONSIDERED FOR NEW FACILITIES

TABLE 2-4
Consolidated Aircraft Maintenance (CAMS) Complex

<u>Reference Key</u>	<u>Facility</u>	<u>Area (square feet)</u>	<u>Need Date¹</u>
AM1	Apron Ramp	864,000	4/93
AM2	Utilities and Roads	NA	12/92
AM3	Fuel Systems Maintenance Dock	17,600	4/93
AM4	Hangar	51,500	4/93
AM5	Field Maintenance Shop	17,700	4/93
AM6	Avionics Shop	12,000	4/93
AM7	COMBS Warehouse	12,000	4/93
AM8	Squadron Operations (T-37)	18,400	4/93
AM9	Squadron Operations (T-43)	12,000	4/93

Source: HQ SAC, 1990.
NA = Not Applicable.
¹Month/Year

Another site is north of the site discussed above and adjacent to and partly overlapping the Fire Protection Training Areas. These areas have been identified and investigated under the ongoing IRP and are jointly referred to as FT-04. Site FT-04 has soil contaminated by fuel hydrocarbons and lead that may potentially threaten groundwater. Cleanup of this contamination is likely to be required, which could delay construction at this location.

In addition, these first two sites are within a larger area designated as ST-23 under the IRP. Old base maps showed 753 locations where underground storage tanks (USTs) may have been abandoned within the former boundaries of Camp Beale. Magnetometers identified 10 possible USTs in an area known as the Camp Beale Hospital Area, a subpart of ST-23. The second alternative CAMS location overlaps part of the Hospital Area. Investigation and removal of possible USTs from this area coupled with possible remedial actions associated with IRP FT-04 led to the exclusion of this alternative location from further consideration.

Another site considered for the CAMS is north of the other two sites and adjacent to taxiway 14. Some grading will be required on this site to prepare it for construction. A small part of this alternative site overlaps IRP ST-23 and its subunit, the Camp Beale Hospital Area. Of the three sites considered, this one has the poorest potential for future expansion; however, this site has been selected for locating the CAMS because it is the most economical and practical.

2.2.3.2 Base Operating Support Complex (BOS)

The purpose of BOS facilities is to provide all those facilities and activities that are necessary for the day-to-day operation of the base and for support of the host and tenant mission. This also includes all Morale, Welfare, and Recreation facilities. Upgrades to existing BOS facilities and construction of new BOS facilities are required to accommodate the realignment. These requirements, presented in Table 2-5, constitute the BOS complex. Other significant space requirements in addition to those for the primary facilities include space for access drives and loading docks for logistics-related functions and privately owned vehicle parking for employees and visitors. Siting criteria included the consideration of access and locations convenient for users. While the BOS complex forms a functional unit, its elements are physically dispersed throughout the base. Each element has distinctive siting requirements that are intrinsic to that element's function.

The Student Officer Dormitory will house the SUNT students while they are receiving training. The dormitory is planned to be adjacent to the buildings in the Academic Complex in the cantonment area. The Transient Lodging Quarters is also planned to be adjacent to the Academic Complex buildings. These quarters will provide temporary housing for enlisted personnel assigned to Beale AFB. Visiting Officers Quarters are planned near, and slightly west of, the Academic Complex. The major siting concern, which was common to all three of these living facilities, is to place them near facilities their occupants will use most heavily. Therefore, they are

TABLE 2-5

Base Operating Support

<u>Reference Key</u>	<u>Facility</u>	<u>Area (square feet)</u>	<u>Need Date¹</u>
BS1	Student Officer Dormitory	250,000	8/93
BS2	Enlarge and Modify Hospital	50,800	7/93
BS3	Transient Lodging Quarters	20 units	1/93
BS4	Visiting Officers Quarters	15 units	1/93
BS5	Military Personnel Base Support Center	30,000	1/93
BS6	In-flight Kitchen	1,050	5/93
BS7	Officers Open Mess	7,500	1/93
BS8	AAFES Facilities	75,536	9/93
BS9	Modify Administrative Facility	31,400	1/93
BS10	Modify Survival Equipment Shop	5,000	1/93
BS11	Enlarge Contonment Physical Fitness Center, New Physical Fitness Center in Flightline	29,000	6/93
BS12	Modify Furniture Storage and Communication Facility	21,000	1/93
BS13	Enlarge Child Development Center	5,000	6/93
BS14	Refueling Vehicle Parking	10,800	4/93

Source: HQ SAC, 1990.

¹Month/Year

planned for locations in or near the Academic Complex and in the cantonment area. To provide food service close to the Academic Complex, where SUNT personnel will work and SUNT students will both live and study, an Officers Open Mess is planned east of the Academic Complex.

Several additional BOS facilities are planned to be built or modified within the cantonment area. Locations for new buildings were chosen to be close to similar activities, near concentrations of base personnel, and to have good access. These facilities include Army Air Force Exchange Service (AAFES) facilities--a new Commissary, a small Shop and Gas convenience store, and expansion of the Base Exchange. The Commissary is planned for an area northeast of 25th street and southeast of B Street and was planned independently of the realignment action. The Shop and Gas is planned for the south quadrant of the intersection of A Street and Doolittle Drive. Another new facility will be the Military Personnel Base Support Center, also known as the Consolidated Base Personnel Office. Facilities to be modified or enlarged in the cantonment area will include Administrative Facilities, the Fitness Center, the Furniture Storage and Communication Facility, and the Base Exchange.

All BOS facilities planned for the cantonment area will be within the boundaries of IRP Site 22. Four possible UST locations were detected by magnetometer in the cantonment area south of Warren Shingle Drive. Investigation of potential locations and removal operations are proceeding and will be completed prior to initiation of construction activity.

While most BOS facilities, existing and planned, are in the cantonment area, a few exist on and are planned for other parts of the base. The Hospital and Child Development Center, located in the eastern part of the base near the family housing area, will be enlarged.

Four facilities in the BOS are planned for the flightline. The specific requirements of personnel on the flightline and the nature of these facilities require their placement there. These facilities include an In-Flight Kitchen and a Physical Fitness Center. Modifications to an existing building will house the Survival Equipment Shop. Parking for Refueling Vehicles will be added adjacent to existing parking.

2.2.3.3 Academic Complex

The primary facilities needed to provide the academic component of the 323rd Flying Wing's training mission at Beale AFB are listed in Table 2-6. The square footage shown in the area column is the footprint for the amount of land area required for each facility.

The Academic Complex must provide all the facilities for navigator training other than those directly related to the aircraft at the flightline. Space is required in the main complex for classrooms, navigator and electronic weapons officer simulators, aerospace physiology functions, associated headquarters and student squadron operations, and a Parasail Area, which will be used for parachute training. The Academic Complex--one functional unit--will occupy two sites because of the specific

TABLE 2-6
Academic Complex

<u>Reference Key</u>	<u>Facility</u>	<u>Area (square feet)</u>	<u>Need Date¹</u>
AC1	Flight Simulator Training (EWO)	40,500	1/92
AC2	Flight Simulator Training (T-45)	29,800	11/92
AC3	Wing Headquarters and Operations Staff Facility	21,000	1/93
AC4	Combined Squadron Operations Facility	26,600	11/92
AC5	Academic Facility	53,000	11/92
AC6	Visual Information and Training Aids	28,000	4/93
AC7	Physiological Training	9,500	11/92
AC8	Parasail Area	51 acres	1/93

Source: HQ SAC, 1990.

Notes:

¹Month/Year

²The acreage for the Parasail area includes all the land inside the parameter road. Most of this land will not be disturbed.

requirements for the Parasail Area, which are discussed later in this section. The facilities that will be adjacent to one another will be referred to as the main Academic Complex, whereas the functional Academic Complex refers to these facilities and the Parasail Area.

Four siting alternatives were considered for the main Academic Complex, all in the cantonment area. Three primary siting criteria for this Complex were integration of the planned facilities with the Base Comprehensive Plan, proximity to community and administrative support functions, and visual enhancement of the southern portion of the cantonment area, which serves as a "gateway" for visitors to the base.

One site considered is in the west-central part of the cantonment area, south of Doolittle Drive and between B and C Streets. This site is not close to some highly-used support facilities, nor does it allow for future expansion. It also would not have a positive impact on the visual quality of the gateway.

Another site considered is adjacent to the site described above, south of the ball fields and west of C Street. This site is not close to support facilities and encroaches on land projected for other uses in the Base Comprehensive Plan.

A site on the eastern edge of the cantonment area, northwest of Warren Shingle Drive, southwest of a drainage channel, and east of A Street was also considered. In addition to the large drainage forming the approximate boundary of the site, other small drainage channels cross the site, posing potential environmental and construction problems. Also, SUNT use of this site would not integrate well with the Base Comprehensive Plan.

The selected site is at the southern edge of the cantonment area, south of Warren Shingle Drive between A and C Streets. No major negative features are associated with this site and it provides a visual improvement for the gateway area.

The Parasail Area presents an unusual siting requirement for a large, open, flat area because it will consist of intersecting 3,000-foot asphalt runways within a 3,000-foot diameter circular road. The runways will be used by motor vehicles that will tow parasail trainees as they practice parachute techniques; therefore, the siting criteria should emphasize safety considerations for trainees. In addition, support facilities, such as a storage building, phone lines, and sanitary facilities, will be required. Alternative locations for this use are still under evaluation. Three potential sites, which are described below, meet the basic criteria of flat open areas.

A site considered is south of Doolittle Drive, between the cantonment and the flightline areas. Concrete foundations and roadbeds remaining from previous developments would have to be removed before construction of a Parasail Area could begin. Washes associated with the Hutchinson Creek drainage would be filled to provide level ground. A U2 flight track crosses the airspace above this site. The U2 may fly as low as 500 feet, while a parasail trainee may be towed as high as 300 feet; therefore, this site allows a very small margin of safety (200 feet) for parasail trainees and U2 aircraft. Currently, this site is used as a bivouac area by Beale AFB. This training activity would have to be relocated if the Parasail Area is located here.

Another site considered is south of Warren Shingle Road, between the cantonment and the flightline areas, and south of the site described above. Foundations and roadbeds from previous development would require removal, and washes associated with Hutchinson Creek, which may include some wetlands, would need filling and leveling. This location is rather close to the base railroad siding and tank farm where fuel is delivered and stored, which may present a potential safety hazard.

The preferred site for the Parasail Area is near the southern base boundary, west of South Earle Road. Although somewhat distant from the main complex, this site is the most economical, requiring no removal of previous development. Also, less grading and filling would be required because this area is generally flat; however, access roads to the site will need to be upgraded. Additionally, vernal pools are known to exist in this area, although no complete survey for them has been conducted. The area in which this site is located has been identified for possible location of artificial wetlands habitat to replace similar habitat that may be lost due to any future construction.

2.2.3.4 Family Housing

The Air Force has conducted a market analysis to determine the number of additional permanent housing units needed to support the realignment of Beale AFB. However, a final determination of the number of units needed, if any, has not been made. Build-to-lease housing is proposed for construction under the authority of Section 801 of the 1984 Military Construction Authorization Act (10USC 2828(g)). Build-to-lease (or Section 801) housing is constructed by a private developer, usually on privately owned land. The housing will be leased to the Air Force who will operate and maintain it for 20 years. Infrastructure and utility systems are required to be turned over to their respective municipality, tax district, or utility company. The Air Force has the right of first refusal to purchase the property should the private developer wish to sell. Section 801 housing can be developed on government-owned land only with special permission of the Secretary of the Air Force, permission that is infrequently given.

A preferred site has not been chosen at this time. Three sites, each of more than 100 acres, are being considered for possible construction of Section 801 housing. One site is on base, just south of existing housing, on Lark Drive and East Garryanna Drive. This land has been identified by the Government Services Administration as excess property to be sold. However, its current government ownership will pose difficulties in qualifying for Section 801.

The other two sites are off base. Both are south of the base, near and north of the town of Wheatland. One is at the edge of the town and the other is between the base and the town. If it is determined that additional housing is required, the impact from its construction and use will be assessed in a separate NEPA document.

2.2.3.5 Demolition Candidates

Ten structures will be demolished to make way for planned new construction. All are in the cantonment area in or adjacent to the planned site of the main Academic Complex. The structures are listed in Section A of Table 2-7 and shown on Figure 2-2. An additional four structures in the same area are being considered for removal but their demolition has not been approved by the base. They are listed in Section B of Table 2-7 and also shown on Figure 2-2. The potential for these structures to be qualified for inclusion on the National Register of Historic Places has not been analyzed. Provisions of the National Historic Preservation Act, including consultation with the SHPO, will be implemented prior to demolition. In addition, the DOD Memorandum of Agreement with the ACHP and the National Conference of State Historic Preservation Officers concerning World War II temporary buildings may apply to some of the demolition candidates. Pertinent provisions of the Agreement will be adhered to, if appropriate.

2.3 SUMMARY OF MAJOR ISSUES AND POTENTIAL IMPACTS

Based on the results of discussions with USAF personnel and letters received from State and Federal agencies in response to the NOI, the scoping process has identified several areas of potential concern associated with the realignment of Beale AFB. Table 2-8 summarizes potential impacts of the realignment for the areas of potential concern.

TABLE 2-7

Buildings Considered for Demolition

A. Buildings that Beale AFB is prepared to have demolished.

<u>Reference Key</u>	<u>Building Number</u>	<u>Facility</u>
DM1	2195	Commissary Warehouse
DM2	2193	Hazardous Material Storage Facility
DM3	2198	High Voltage Electrical Switching Station
DM4	2174	Decontamination Facility
DM5	2176	Dormitory
DM6	2177	Dormitory
DM8	2185	Morale, Welfare, and Recreation Rental and Zone C Operations
DM9	2184	Incinerator
DM10	2180	Veterinarian
DM14	2131	Military Working Dog Kennels

B. Buildings that could be removed; however, demolition has not been approved by Beale AFB.

DM7	2175	Dormitory
DM11	2179	Class 6 Storage, Social Actions, and Area Defense Council
DM12	2171	Communications Squadron
DM13	2172	Communications Squadron

Source: HQ SAC, February 1990.

TABLE 2-8
Potential Realignment Impacts on Key Areas of Concern

Area of Concern	Implementation of Realignment Action		Mitigation Measures
	Construction	Operation	
Mission and Operations	Negligible	<p>Increase personnel by 1,602</p> <p>Transfer 36 aircraft</p> <p>Increase flight operations by 34%</p> <p>Increase total base population by 3,435</p>	
Geology and Topography	<p>Terrain modification</p> <p>Dust generation</p> <p>Potential for erosion</p>	<p>Earthquake-induced strong groundmotion</p> <p>Liquefaction, settlement, and expansion of soils</p> <p>Potential for erosion</p>	<p><u>Proposed:</u></p> <p>Dissipate and direct runoff.</p> <p>Revegetate</p> <p>Limit grading activity</p> <p>Balance cut and fill quantities</p> <p><u>Potential:</u></p> <p>Design and construct facilities to withstand strong groundmotion.</p> <p>Perform geotechnical investigations</p>
Air Quality	<p>ROC = 3.82 tons</p> <p>NO_x = 30.47 tons</p> <p>SO₂ = 2.65 tons</p> <p>CO = 53.96 tons</p> <p>PM₁₀ = 34.99 tons</p>	<p><u>Aircraft Emissions:</u></p> <p>ROC = 26.18 tons/year, 3% increase</p> <p>NO_x = 103.90 tons/year, 26% increase</p> <p>SO₂ = 4.76 tons/year, 8% increase</p> <p>CO = 85.16 tons/year, 0.04% increase</p> <p>PM = 5.37 tons/year, 25% increase</p> <p><u>Secondary Emissions:</u></p> <p>ROC = 5.10 tons/year</p> <p>NO_x = 6.32 tons/year</p> <p>SO₂ = 0.63 tons/year</p> <p>CO = 44.37 tons/year</p> <p>PM = 1.55 tons/year</p>	<p><u>Proposed:</u></p> <p>Implement dust suppressant measures</p> <p><u>Potential:</u></p> <p>Minimize overlap of construction activity</p> <p>Vapor recovery systems on gasoline-powered construction equipment</p> <p>Curial construction activity during high ozone periods</p> <p>Pave haul routes and cover stockpiles</p> <p>Develop transportation plan</p> <p>State-of-the-art natural gas boilers for new facilities</p>
Water Resources	Negligible	Increase groundwater demand	<p><u>Proposed:</u></p> <p>Minimize grading activity during rainy months</p> <p>Incorporate best available storm water management practices into grading and site preparation</p>

TABLE 2-8 (cont'd)

Area of Concern	Implementation of Realignment Action		Mitigation Measures
	Construction	Operation	
Biological Resources	Loss of wetlands habitat ¹ Loss of introduced annual grassland habitat	Negligible	<u>Proposed:</u> Limit grading areas Exclude construction activity from cottonwood grove Avoid and protect wetland habitat Re-establish vegetation Develop vernal pool management area
Archaeological, Cultural, and Historic Resources	Ground disturbance may break, displace, or remove archaeological material	Increase potential for casual collecting and ground disturbance	<u>Proposed:</u> Initiate or complete surveys Conduct archaeological monitoring during construction Consult with SHPO
Noise	Negligible	2% increase in land area exposed to noise in excess of 65 L ₉₀	<u>Proposed:</u> Minimize night flight activity
Land Use	Negligible	2% increase in land area that may require use restriction because of noise levels	None
Transportation	Negligible	671 additional peak period round trips ² Increased use of on-base roads, parking, and rail and truck deliveries	<u>Potential:</u> Improve intersections, reduce traffic in central cantonment area, and upgrade signing, striping, and beacons Improve and expand parking facilities Replace right-hand passing lanes with left-turn lanes Develop pathway systems Develop local road for Exchange and Commissary Develop collector road access to flightline Expand gates Encourage a decrease in single-occupant car trips
Utilities: Electrical Supply and Communications	Negligible	Negligible	None

TABLE 2-8 (cont'd)

Area of Concern	Implementation of Realignment Action		Mitigation Measures
	Construction	Operation	
Water Supply	Negligible	20% increase in water demand	<p><u>Proposed:</u> Replace or repair supply line from well field</p> <p><u>Potential:</u> Add second supply line to flightline Add additional supply pump Add water treatment for mineral levels</p>
Waste Management:			
Solid Waste Disposal	Negligible	20% increase in waste generated	<p><u>Potential:</u> Recycle wastes</p> <p><u>Potential:</u> Add backup lift pump Develop storm water management plan</p>
Wastewater Disposal	Negligible	20% increase in volume of wastewater	None
Hazardous Waste Generation	Negligible	Increase in volume of hazardous waste	None
Installation Restoration Program	Negligible	Negligible	None
Underground Storage Tanks	Potential for tanks to exist at planned construction locations	Negligible	<p><u>Proposed:</u> Ground truthing of geophysical survey results and removal of tanks, if found</p> <p>Geophysical surveys of unsurveyed areas</p>
Asbestos	Asbestos confirmed, suspected, or possible in buildings to be demolished or remodeled.	Negligible	<p><u>Proposed:</u> Detailed survey and sampling and appropriate remedial measures</p>
Socioeconomics:			
Impact-Generating Factors	Construction spending	Additional base personnel spending	None
Demographics	Negligible	Population increase of 4,100 people, or 3.3%	None

TABLE 2-8 (cont'd)

Area of Concern	Implementation of Realignment Action		Mitigation Measures
	Construction	Operation	
Employment	3,465 additional person-years of construction work	2,200 additional jobs	None
Personal Income	\$70 million accruing to households	\$48 million annually accruing to households	None
Housing	Negligible	Increased demand for housing could be accommodated by existing market ³	None
Education	Negligible	450 to 475 additional students \$652,600 to \$688,850 in additional impact assistance	None
Community Services and Facilities	Negligible	Increased demand for these services and facilities ⁴	None

¹A final selection of a Parasail Area site will greatly influence the actual extent of impact to biological resources.

²Impacts on peak round trips assumes no housing for permanent party will be added on base. The decision on this issue is still pending.

³A decision is still pending on the construction of additional housing. The suitability of vacancies in the existing market is still under study.

⁴The realignment action includes additions to these services and facilities.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

3.1.1 History

Camp Beale, named for General Edward Fitzgerald Beale, opened in October 1942 with more than 86,000 acres of land. During World War II, the camp was used as an infantry training center, a personnel replacement depot, and a prisoner-of-war (POW) camp. The POW camp may be considered of historic importance. During the war, the camp supported a military population of more than 60,000 personnel.

Camp Beale was declared surplus in 1947, and in early 1948, transfer to the USAF was arranged. The base was used for bombardier-navigator training. In 1951, Headquarters USAF announced the reactivation of the Beale Bombing and Gunnery Range as a training site and officially changed the name to Beale Air Force Base.

During Beale's early years in the Air Force, the base underwent a number of organization changes, at times being a part of ATC, Continental Air Command, Aviation Engineer Force, and finally SAC. Early in 1959, it was announced that the 14th Air Division would be assigned to Beale AFB. In July 1959, Beale received its first KC-135 jet strato tanker, with B-52 bombers arriving shortly afterwards. In September of 1959, it was announced that Beale was to be the support base for three Titan missile sites. By 1965, the Titan I missile program had been discontinued, and the squadron was deactivated. Coupled with the deactivation of the missile unit, however, was the beginning of a new era in the history of the base with the activation of the 4200th SRW, later redesignated as the 9th SRW.

3.1.2 Mission

The mission of the 9th SRW is to provide global aerial reconnaissance and air refueling support in wartime in accordance with provisions of the Emergency War Order. In peacetime, reconnaissance flights and reconnaissance air refueling support are conducted in response to the Peacetime Aerial Reconnaissance Program and contingency tasking from the National Command Authorities and the Joint Chiefs of Staff. At the same time, the wing supports the requirements of unified and specified commands. After raw intelligence data are collected by reconnaissance aircraft, the 9th SRW processes, reports, and disseminates intelligence products to specified civilian and military users.

The major tenant organizations at Beale AFB are the 14th Air Division and the 7th Missile Warning Squadron. The 14th Air Division's mission is to ensure that units assigned to the division are capable of conducting worldwide strategic reconnaissance and maintaining an airborne command post in continuous operation.

The primary and secondary missions of the 7th Missile Warning Squadron's Precision Acquisition Vehicle Entry Phased Array Warning System (PAVE PAWS) are to provide warning and attack assessment of a sea-launched and/or intercontinental

ballistic missile attack aimed at the continental United States and Southern Canada. The tertiary mission is to provide surveillance, tracking, reporting, and identification of objects in space through a system known as Space Track.

Existing personnel who carry out these missions at Beale AFB are detailed in Table 3-1. Flight activity that fulfills Beale AFB mission objectives averages approximately 665 operations per day (HQ SAC, 1990). An operation is one takeoff, one landing, one low approach, or one touch and go.

3.1.3 Existing Development

Development at Beale AFB is basically confined to three functional areas--the flightline area, the cantonment area, and the family housing area. Figure 3-1 presents these three areas in relationship to one another.

The flightline area, besides containing the mission-essential runway and associated taxiway and aprons, includes aircraft operation and maintenance facilities, mission support activities, supply activities, and ground vehicle maintenance and fueling activities. The runway is 12,000 feet long and 300 feet wide, with asphalt overruns of 1,000 feet on the south and 2,250 feet on the north. The runway is capable of handling any aircraft in the Air Force inventory. Additionally, Explosive Ordnance Demolition and fire protection and training functions are carried out in this area, as are some administrative operations. The flightline area has a small complement of community commercial and service facilities, as well as a small recreational facility.

The cantonment area supports many of the administrative functions and organizations operating in the flightline area. This area is also the central business district for the base, dominated by administrative, community commercial, unaccompanied housing, and industrial uses. Social, maintenance, medical, and spiritual facilities are located here, as are base engineering and environmental operations.

The family housing area provides base housing for accompanied officers and enlisted personnel. A fire station and an administrative office are also present here, along with a number of other community service, commercial, and recreational facilities.

3.2 GEOLOGY, TOPOGRAPHY

3.2.1 Geologic Setting

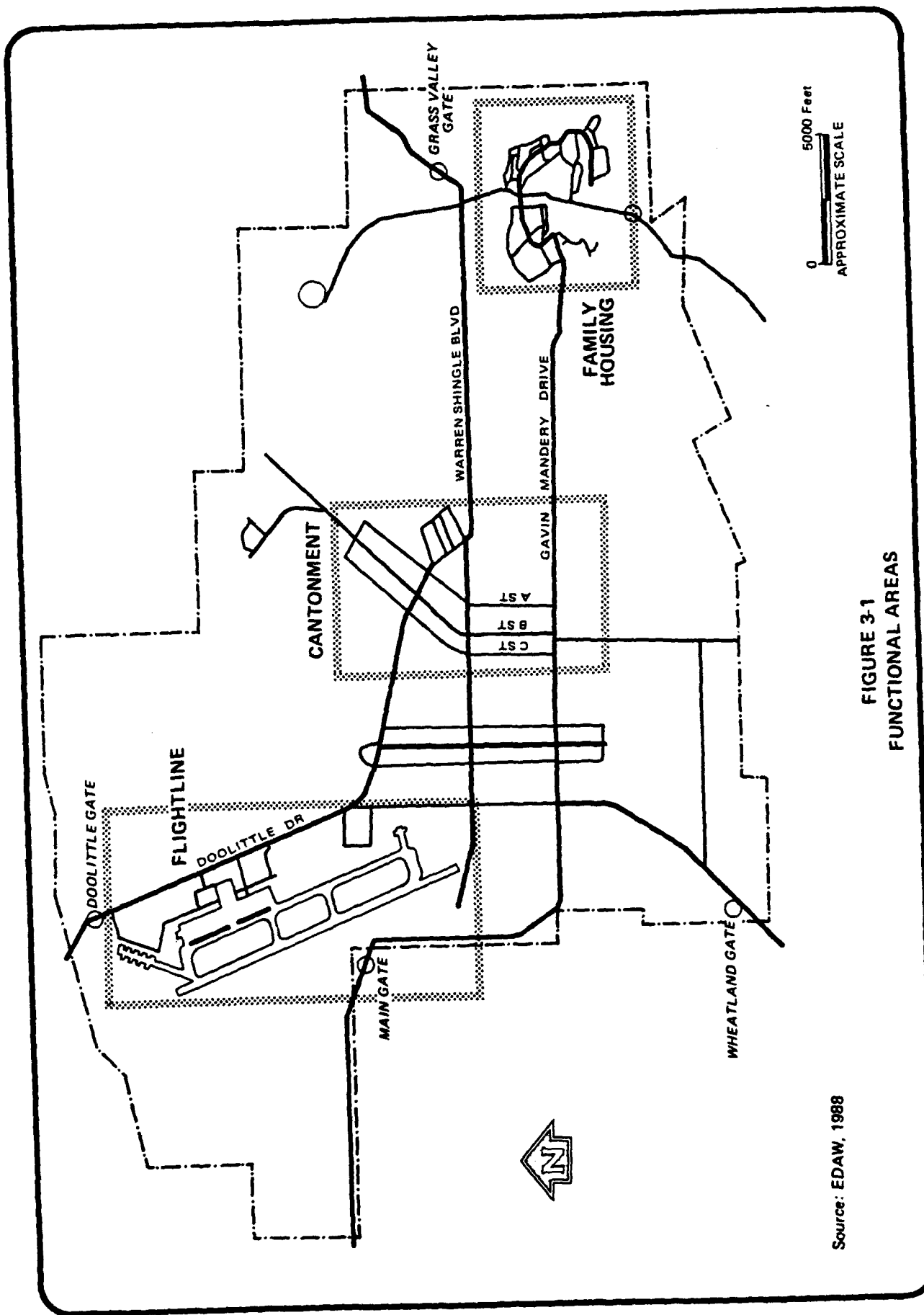
Beale AFB is approximately 40 miles north of the City of Sacramento in the eastern part of the Sacramento Valley. The Sacramento Valley together with San Joaquin Valley to the south constitutes the Great Valley of California (Figure 3-2). Extending from Redding in the north to Bakersfield in the south, this valley is about 60 miles wide, bordered to the east by Sierra Nevada Foothills and to the west by the Coast Ranges.

TABLE 3-1

Units Assigned to Beale AFB as of 8 February 1990

	<u>Military</u>	<u>Civilian</u>	<u>Total</u>
14 Air Division	71	22	93
9 Strategic Reconnaissance Wing	241	6	247
5 Strategic Reconnaissance Training	39	1	40
99 Strategic Reconnaissance Squadron	53	-	53
349 Air Refueling Squadron	102	-	102
350 Air Refueling Squadron	104	-	104
9 Avionics Maintenance Squadron	133	-	133
9 Field Maintenance Squadron	304	9	313
9 Organizational Maintenance Squadron	357	1	358
609 Organizational Maintenance Squadron	315	4	319
9 Reconnaissance Technical Squadron	57	2	59
814 Supply Squadron	284	33	317
814 Transportation Squadron	117	28	145
814 Combat Support Group	42	28	70
814 Civil Engineering Squadron	263	179	442
814 Security Police Squadron	233	1	234
814 Services Squadron	64	2	66
814 Mission Support Squadron	89	27	116
814 Strategic Hospital	381	40	421
814 Comptroller Squadron	46	19	65
Detachment 6, 3904 Management Engineering Squadron	8	3	11
7 Missile Warning Squadron	65	7	72
1360 Audiovisual Squadron	15	1	16
Detachment 625, 3753 Field Training Squadron	28	-	28
Detachment 11, 9 Weather Squadron	15	2	17
1883 Communications Squadron	153	7	160
Detachment 6, 2163 Communications Group	11	-	11
Air Force Commissary	71	43	114
Air Force Legal Services	2	-	2
Air Force Office of Special Investigations	<u>5</u>	<u>1</u>	<u>6</u>
TOTAL	3,668	466	4,134

Source: Capt. Mark K. Plaster
 Det. 6, 3904 MES/SACMET
 Beale AFB



Source: EDAW, 1988

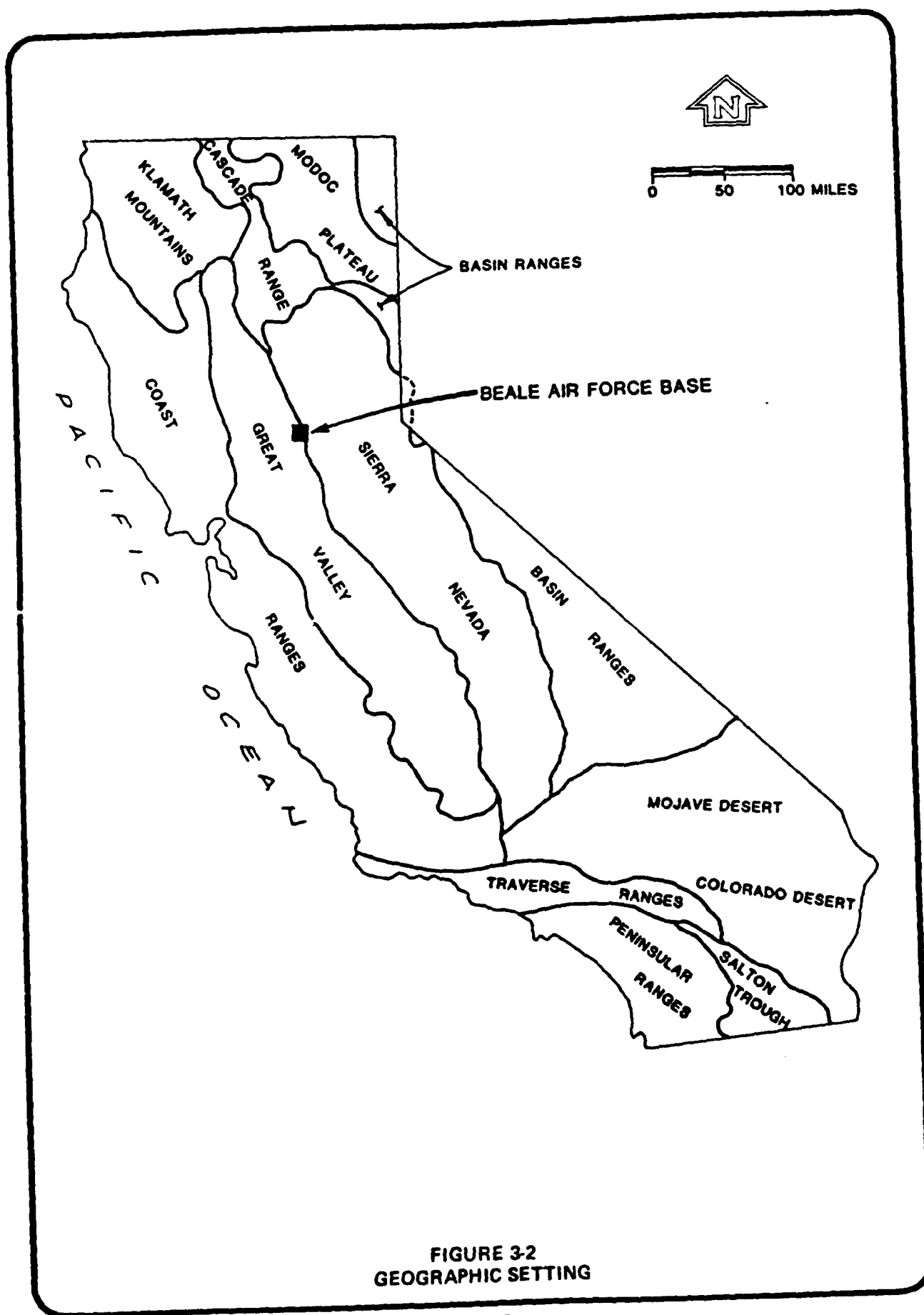


FIGURE 3-2
GEOGRAPHIC SETTING

3.2.2 Geomorphology

As shown on Figure 3-2, Beale AFB lies on the boundary of the Great Valley Province and the Sierra Nevada Province. The Sierra Nevada Province is a strongly asymmetric mountain range. It has formed as a huge block of the earth's crust that is being uplifted along a fault system on the east side of the range and tilted westward. This has resulted in the Sierra Nevada having a long, gentle western slope and a steep eastern escarpment.

The Great Valley Province was formed as a structural downwarp between the Coast Range Province on the west and the Sierra Nevada Province on the east. It has been filled with alluvial deposits derived from the erosion of the Sierra Nevada and the Coast Ranges. Extending more than 400 miles from north to south and averaging about 60 miles wide, the Great Valley comprises the Sacramento Valley in the north and the San Joaquin Valley in the south. On its eastern boundary, the alluvial deposits of the Great Valley overlap bedrock of the Sierra Nevada block, which continues to slope gently to the west.

Because of its location on the boundary of the two provinces, Beale AFB displays characteristics of both the Great Valley and the Sierra Nevada. The western portion of the base is relatively flat grassland, characteristic of the Great Valley. Moving eastward, the plains become low rolling hills that gradually merge with the foothills of the Sierra Nevada.

Three geomorphic units characteristic of the Great Valley Province are present at Beale AFB--river flood plains and channels, low alluvial plains and fans, and dissected uplands. These units are shown conceptually on Figure 3-3.

River plains and channels lie along the major drainages at Beale AFB. As these streams have meandered in recent geologic time, they have deposited sands and gravels along their channels, and silts and clays on their flood plains. Where present, these deposits may range in thickness up to about 100 feet on the western edge of the base. Low alluvial plains and fans comprise most of the western part of the base. This unit is generally flat to gently rolling and is composed of alluvial deposits of mainly Pleistocene age. Unlike the river flood plains and channels, little or no deposition is taking place on this surface and, consequently, a mature soil profile has developed, which contains cemented sediments in many locations.

Dissected uplands form the eastern edge of the Great Valley, and comprise most of the central portion of Beale AFB. This unit ranges from gently rolling land to dissected hills, with relief of up to several hundred feet. Dissected uplands are composed of unconsolidated to semiconsolidated continental deposits of mainly Pleistocene and Pliocene age (Poland and Evenson, 1966). This surface is being eroded at the present time.

Moving eastward into the foothills of the Sierra Nevada at Beale AFB, the topography gets progressively steeper, and outcrops consist of mostly older consolidated sedimentary rocks of Oligocene to Pliocene age. On the eastern boundary of the base

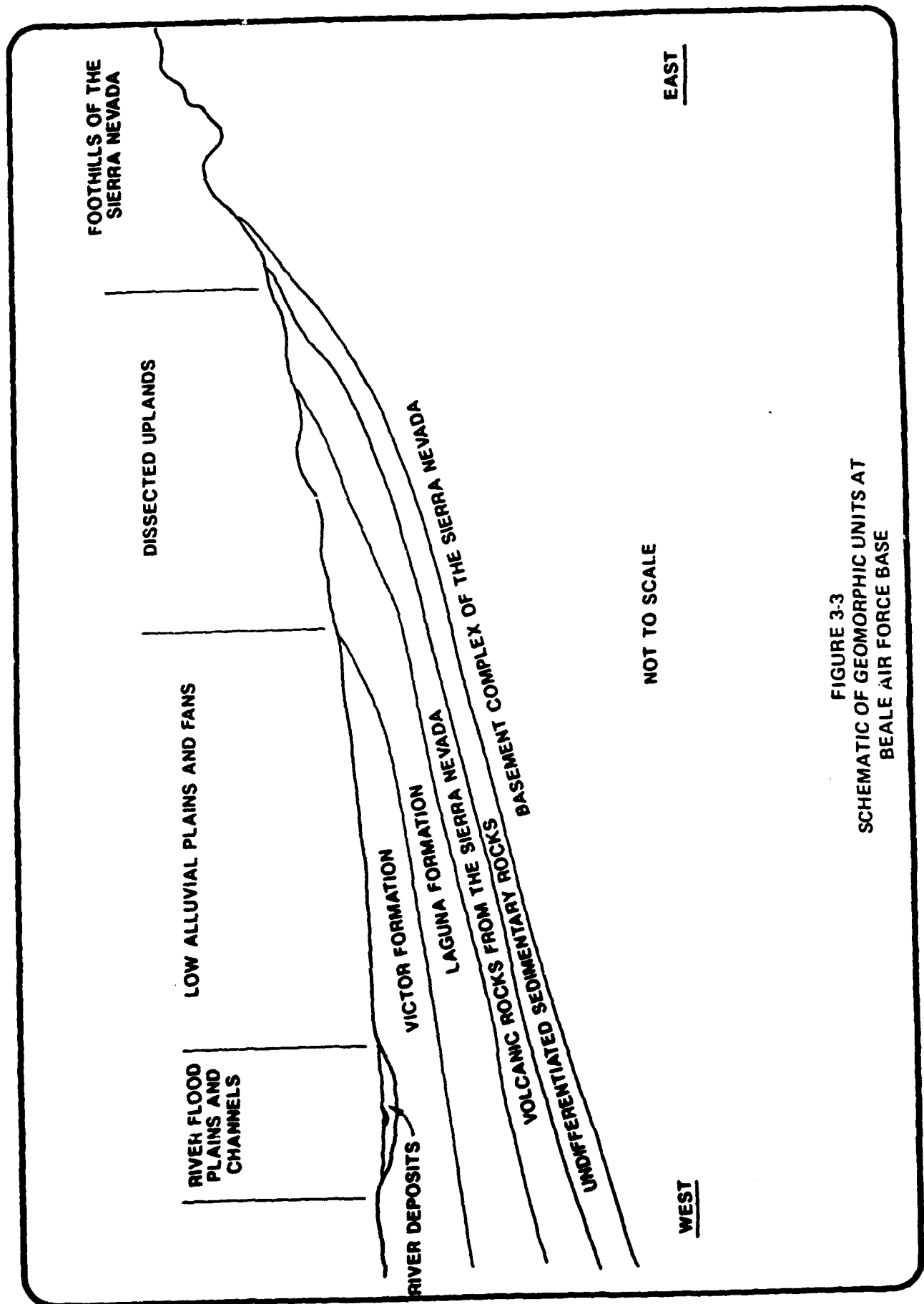


FIGURE 3-3
SCHEMATIC OF GEOMORPHIC UNITS AT
BEALE AIR FORCE BASE

are exposures of the crystalline basement rock of the Sierra Nevada, which range in age from Mesozoic to Paleozoic.

3.2.3 Seismic Activity

The most recent seismic activity in the vicinity of Beale AFB was the minor movement that occurred along the Cleveland Hill Fault about 25 miles north of the base and accompanied the 1975 Oroville earthquake sequence. Other mapped faults in the area include the Highway 49 lineament about 20 miles east of Beale AFB and a shear zone, located a few miles east of the base, that trends in a northwesterly direction. There are no known active or inactive faults within the boundaries of Beale AFB (Black and Veatch, 1985).

3.2.4 Soils

Soils at Beale AFB have been recently mapped by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS, 1985). The formation of soil at a particular location is controlled by the geology, landforms, relief, climate, and vegetation at that location. The resulting characteristics of a particular soil, such as its texture, permeability, and mineralogy, may affect the movement of groundwater. Detailed soil maps, profile descriptions, and tables of engineering properties may be found in the Soil Survey (SCS, 1985).

Much of the western portion of the base is covered by San Joaquin loam. This is a moderately deep, moderately well-drained soil formed on old alluvial terraces at an elevation of between 60 and 130 feet National Geodetic Vertical Datum. San Joaquin loam typically contains a layer of hardpan at a depth of between 20 and 40 inches. The infiltration rate is moderate (0.6 to 2.0 inches per hour) above about 16 inches in silt and silty clay, and very slow (less than 0.06 inches per hour) below this depth in clay.

Redding-Corning gravelly loams cover most of the central part of the base, including the flightline and cantonment areas. These soils are moderately deep to very deep and are well-drained. They form on old alluvial terraces at an elevation of between 110 and 250 feet. A layer of hardpan is commonly found at a depth of between 20 and 40 inches. The infiltration rate is moderate (0.6 to 2.0 inches per hour) in the upper 2 feet in clayey and silty sands and gravels. Below this depth, the permeability is very slow in clays.

Pardee-Pardee Variant complex and Pardee gravelly loam covers much of the northeastern part of the base. These are shallow, well-drained soils formed in gravelly and cobbly alluvium on old, dissected alluvial terraces above unrelated igneous bedrock at an elevation of between 120 and 250 feet. The infiltration rates of the soils are moderately slow to moderate (0.2 to 2.0 inches per hour) in silty and clayey sands and gravels.

On the northeastern edge of the base in the foothills between elevations of about 125 and 1,100 feet are Auburn-Argonaut loams. These soils are shallow to moderately deep and well-drained, formed in residuum from basic metavolcanic rock.

Bedrock may be found at depths of 10 to 40 inches beneath the Auburn-Argonaut loams. Infiltration rates range from very slow to moderate (less than 0.06 to 2.0 inches per hour) in silts and clays.

Perkins loam and Conejo loam are found along the drainages at Beale AFB. These are very deep, well-drained soils formed on stream terraces in alluvium derived from mixed sources. Perkins loam tends to be found along the upper reaches of the drainages. Its permeability is moderately slow (0.6 to 2.0 inches per hour), and it is composed of silts and clays, with some silty and clayey gravel below about 5 feet in depth. Conejo loam is normally found in the lower reaches of the drainage courses. This soil shows a moderate infiltration rate (0.2 to 2.0 inches per hour) in silts and clays.

3.3 AIR QUALITY

3.3.1 Climate

The regional climate of Beale AFB is controlled by its interior valley location between the Coastal Range and the Sierra Nevada mountains. Because of its inland location, the valley experiences warm summers and cool winters. Pacific storms migrating across California contribute to most of the annual rainfall that occurs between November and April. The average annual daily maximum temperature is 73 degrees Fahrenheit (F), while the average daily minimum is 47 degrees F. Snow falls on occasion in the Sacramento Valley. Relative humidity is variable and the area experiences approximately 34 days of fog annually (Ruffner, 1985).

The prevailing wind direction at Beale AFB is southwest, and averages 5.6 miles per hour (mph) during the summer and 5.5 mph during the winter. The annual average wind speed is 5.6 mph (CARB, 1984). Atmospheric temperature inversions (air temperature increasing with height) are common in the region, creating a capping effect and holding air pollution near the surface. These inversions occur particularly during the late evening and early morning hours, and break down during the day due to surface convective heating and atmospheric mixing. During the summer, the base of these inversions is usually between 800 and 1,000 feet during the morning, and lifts to approximately 6,000 feet above ground level by afternoon. During the winter, the base of the morning inversion is approximately 1,200 feet, but lifts only to 3,000 feet by afternoon due to weaker surface convective heating (Holyworth, 1972). An analysis of 5 years of meteorological data from the Sacramento Executive Airport showed that stable conditions exist approximately 75 percent of the time.

3.3.2 Air Resources

Beale AFB is located in southern Yuba County and occupies portions of the Sacramento Valley and Mountain Counties Air Basins for which the California Air Resources Board (CARB) reports ambient air quality data. No air monitoring stations are located on the base. The closest air monitoring stations reporting to the CARB are Auburn, Yuba City, Pleasant Grove, and North Highlands. These stations monitor ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and 10-micron or less particulate matter (PM_{10}). The Auburn monitor, located

approximately 16 miles southeast of Beale AFB, monitors O_3 and PM_{10} . The Pleasant Grove station is situated approximately 20 miles south of Beale AFB and monitors O_3 ; and the North Highlands monitor is approximately 5 miles south of the Pleasant Grove station and samples SO_2 , O_3 , CO, and NO_2 . Air quality background concentrations for 1985 through 1987 collected at these stations are presented in Table 3-2.

Maximum background air quality data from the above-mentioned table are compared to National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) in Table 3-3. This table shows that State and Federal 1-hour O_3 standards and State 24-hour PM_{10} standards were exceeded at least once within the 1985-1987 collection period.

The United States Environmental Protection Agency (EPA) has designated Yuba County an attainment area for all pollutants except O_3 . An attainment area is a region or air basin in which monitored air quality levels are in compliance with the NAAQS. In addition, the background data listed in Tables 3-2 and 3-3 shows that the 24-hour PM_{10} CAAQS standard of 50 ug/m^3 was violated at the Yuba City station in Sutter County at least once during the 1985-87 sampling period.

CARB also reports the average daily air emissions for air basins and counties based on information provided to them by each Air Pollution Control District. This information for Yuba County for 1983 (the most current available) is presented in Appendix A. Sources of emissions are presented by category. In this inventory, aircraft operating from Beale AFB are categorized under Other Mobile Sources as Aircraft-Government. This category of sources contributed less than 6 percent of the total organic gases, 7 percent of the reactive organic gases, slightly more than 2 percent of the carbon monoxide, and less than 5 percent of the oxides of nitrogen emitted county-wide.

A complete air emissions inventory reflecting current base operations (stationary sources and aircraft) is not available (Personal Communication, Capt. Sherman, Beale AFB). The Yuba County Air Pollution Control District has issued a facility-wide permit for most stationary source emissions at Beale AFB. The permitted equipment includes the following: five paint shops and paint spray booths; six degreaser and solvent tanks; 31 fuel storage tanks and 50 tank trucks; two incinerators; 157 boilers, furnaces, and hot water heaters; 132 pieces of aviation ground equipment on the flightline; 64 power generators at the power production shop; and 66 generators elsewhere on base. The cumulative air emissions from these sources are permitted at the following levels: 70 tons per year total hydrocarbons, 100 tons per year NO_x , 22 tons per year SO_x , 3.7 tons per year PM_{10} , and 73 tons per years CO. These do not, however, reflect the total composition of base operating emissions because permitted sources contribute only part of the total operating emissions.

Existing aircraft emissions at Beale AFB have been compiled by HQ SAC using the Aircraft Engine Emissions Estimator, November 1985. The number of flight operations per month per aircraft type were input to determine the amount of emissions produced. The inventory excludes transient aircraft that had less than one operation per month. Data to determine emissions from U-2 aircraft are classified

TABLE 3-2
Summary of Relevant Air Quality Data
Surrounding Beale Air Force Base
1985-1987

Station	Year	O ₃ (ug/m ³)			SO ₂ (ug/m ³)			CO (ug/m ³)		NO ₂ (ug/m ³)		PM ₁₀ (ug/m ³)	
		1 Hour	Annual	1 Hour	3 Hour ¹	24 Hour	Annual	1 Hour	8 Hour	1 Hour	Annual	24 Hour	Annual
Auburn	1985	280	74										
	1986	340	78										
	1987	360	83										
Yuba City	1985	220	60									78	36.2
	1986	280	60									98	32.7
	1987	240	70									86	34.9
Pleasant Grove	1985	240	60										
	1986	280	56										
	1987	280	60										
North Highlands Blackfoot	1985	360	48	27	24	21	0	11,676	7,356	173	27		
	1986	320	56	27	24	19	0	11,676	7,356	173	27		
	1987	280	54					10,509	8,524	191 ²	42 ²		

ug/m³ = micrograms per cubic meter.

¹Estimated as 90 percent of 1 hour measured concentration (EPA, 1977).

²North Highlands station ceased monitoring NO₂ in 1987. These measurements were taken from the Citrus Heights, Sunrise Boulevard Monitoring Station (approximately 25 miles south of Beale Air Force Base).

Source: CARB, 1985, 1986, 1987.

TABLE 3-3

Maximum Background Air Quality Concentrations
Surrounding Beale Air Force Base
1985-1987

<u>Pollutant</u>	<u>Averaging Period</u>	<u>Maximum Background Concentration (ug/m³)</u>	<u>CAAQS (ug/m³)</u>	<u>NAAQS (ug/m³)</u>
O ₃	1 hour	360	180	240
	Annual	83	-	-
NO ₂	1 hour	194	470	-
	Annual	42	-	100
CO	1 hour	11,700	23,000	40,000
	8 hour	8,520	10,000	10,000
SO ₂	1 hour	27	655	-
	3 hour	24	-	1,300
	24 hour	21	131	365
	Annual	0	-	80
PM ₁₀	24 hour	98	50	150
	Annual	36.2	30	50

ug/m³ = micrograms per cubic meter.
Source: CARB, 1985, 1986, 1987.

and, therefore, unavailable for inclusion in this inventory. Annual emissions in tons per year for aircraft at Beale AFB are presented below.

Carbon Monoxide	2,116 tons/year
Hydrocarbons	839 tons/year
Nitrogen Oxides	399 tons/year
Sulfur Oxides	64 tons/year
Particulates	22 tons/year

3.4 WATER RESOURCES

3.4.1 Groundwater

Groundwater movement in the region has historically been in a direction from the Sierra Nevada foothills eastward to the Feather and Sacramento Rivers. Until the early part of this century, these river systems served as groundwater discharge systems. However, extensive farming and irrigation in the Sacramento Valley area rapidly lowered the water table and altered the direction of groundwater flow, thus changing these rivers from discharge to recharge systems (Aerovironment, 1987).

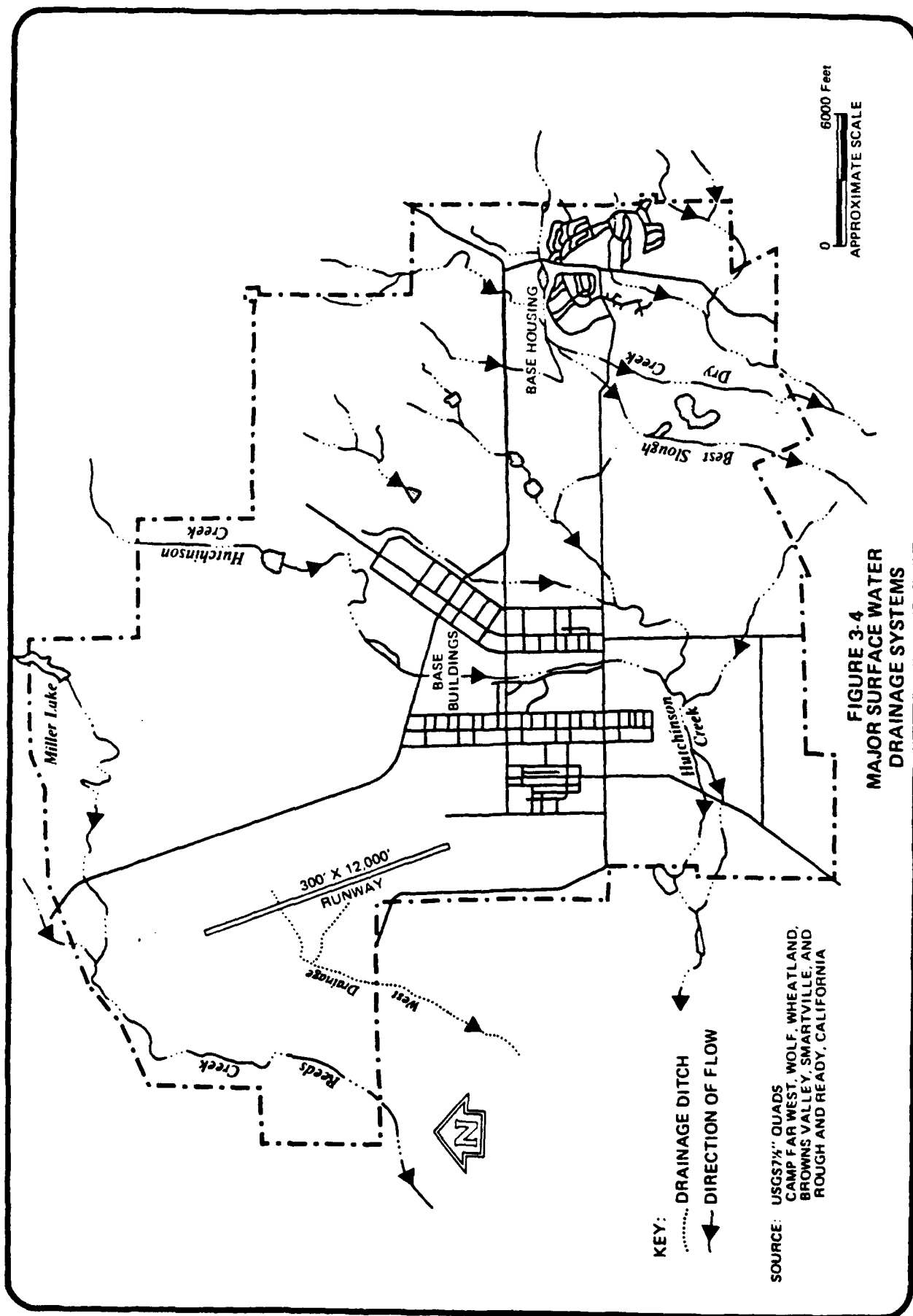
Groundwater generally flows in a westerly/southwesterly direction across the base. The most obvious groundwater characteristic in the area is intense drawdown southwest of the base boundary caused by irrigation pumping. Between 1945 and 1974, the water table fell about 60 feet, then stabilized in the mid-1970s. However, between 1977 and 1980, the water table declined sharply once more in response to drought and increased irrigation for rice production (Aerovironment, 1987). Since 1980, the water level has risen markedly as a result of increased precipitation and lower rice production. Nevertheless, the overall drawdown has been sufficient to alter the direction of local flow in the area of the base well-field from west to nearly south.

It is assumed that groundwater tapped for base use is basically unconfined except where local clay/silt lenses cap the aquifer to produce semiconfined conditions. Fresh water occurs at a depth of between 300 and 500 feet below the surface under most of the base.

3.4.2 Surface Water

Runoff from the base is collected and converged offsite by three principal drainage systems--Dry Creek, Hutchinson Creek, and Reeds Creek. With the exception of Dry Creek, these streams are primarily intermittent (Figure 3-4). Because of impervious soil conditions, lack of topographic relief, and infrequent but sometimes heavy precipitation, the streams in the western portion of the base exhibit wide flood plain areas.

Dry Creek originates to the east of the base and flows to the southwest as Best Slough and Dry Creek, eventually discharging into the Bear River. Hutchinson Creek, which is the largest surface water system on the base, flows mainly southward on base and eventually joins Reeds Creek. Reeds Creek flows mainly westward through the



base and generally parallels the northern base boundary. Reeds Creek and Hutchinson Creek converge before they drain into Plumas Lake southwest of the base.

Both the flightline and the cantonment areas drainage is collected by Hutchinson Creek and its tributaries. Surface runoff from the family housing area is collected by tributaries of Dry Creek.

3.4.3 Water Quality

3.4.3.1 Groundwater

Natural water quality at Beale AFB is generally good, with base water supply wells (Page, 1980) and most monitoring well samples meeting national primary and secondary drinking water standards. Groundwater in the northern part of the base in the vicinity of the flightline is recharged in large part by infiltration from the Yuba River located just north of the base boundary. This groundwater is low in Total Dissolved Solids (TDS) (161 to 233 milligrams per liter [mg/l]) compared to the secondary drinking water standard of 500 mg/l. Nitrate is generally less than 10 mg/l, ranging from 3.4 to 12.5 mg/l. These values are higher than those for pristine groundwater, but lower than those for other areas at Beale AFB and well below the national primary drinking water standard of 45 mg/l. Sulfate levels are all well below the 250 mg/l secondary drinking water standard (CH₂ M Hill, 1990).

Groundwater in the central part of Beale AFB is further from river recharge areas. The central area groundwater had higher TDS (260 to 385 mg/l) than in either the north or south areas. Nitrate levels, while still below secondary drinking water standards, were higher than in the north area, possibly because of fertilizer or cattle grazing in the area or irrigation of the golf course with water discharge from the sewage treatment plant (STP). Sulfate ranged from 10 to 65 mg/l, well below the secondary drinking water standard of 250 mg/l (CM₂ M Hill, 1990).

Groundwater in the southern part of Beale AFB is recharged largely on base by infiltration from Dry Creek, Best Slough, and Hutchinson Creek; from precipitation east of the base; and to a lesser degree from the Bear River south of the base. TDS generally ranged from 192 to 292 mg/l. Nitrate was higher here than in the north area, possibly related to fertilizer or cattle grazing in the area, and generally ranged from levels too low to be detected to 25 mg/l near the STP. Sulfates generally ranged from 5 to 48 mg/l (CM₂ M Hill, 1990).

Water from supply wells at Beale AFB is generally of good chemical quality. However, water from six base water supply wells exceeded the national secondary drinking water standard for manganese of 0.05 mg/l when tested in 1975. Dissolved manganese is objectionable in water because it affects taste, stains plumbing, and accumulates as deposits in distribution systems (Page, 1980). Complaints by water users of discolored water and staining of laundry washed in water with high manganese levels are received approximately once a month. During periods of high demand, the base is forced to use water from the wells known to have high manganese levels. The water distribution system is frequently flushed to remove accumulated deposits

(Personal Communications, Tony Guerrero, Beale AFB, 1990). Manganese was also present in off-base agricultural and water supply wells.

3.4.3.2 Surface Water

Water quality parameters were measured in surface water samples at Beale AFB as part of the IRP Stage 2-1 Remedial Investigation. Results of these analyses and related quality control data are presented in Appendices A and F of that report (CH₂M Hill, 1990). The following discussion is summarized based on these results.

Surface water was sampled within, and at three different tributaries of Hutchinson Creek. TDS varied from 69 to 169 mg/l in the Hutchinson Creek samples. Surface water type varied in Hutchinson Creek ranging from sodium-calcium bicarbonate to magnesium-calcium bicarbonate to sodium-magnesium bicarbonate. Surface water at the west side drainage ditch, which flows to Hutchinson Creek, had TDS of 157 mg/l and was a calcium-sodium bicarbonate type.

Surface water quality was not measured in other drainage systems at Beale AFB; however, it can be assumed to have similar characteristics to those reported for Hutchinson Creek.

3.5 BIOLOGICAL RESOURCES

3.5.1 Vegetative Resources

3.5.1.1 General

Beale AFB contains extensive open space and a variety of vegetation, including annual grassland, freshwater marsh, oak woodland, riparian woodland, and vernal pools. Most of the base is undeveloped, consisting primarily of annual grasslands on gently rolling hills and flats. Freshwater marshes and oak and riparian woodlands are relatively uncommon on the base, especially in areas where SUNT facilities will be located.

Annual grasslands are dominated by a variety of native and introduced grasses, including wild oats, barley, and Italian rye grass. Several spring flowering herbs were also observed, including brodiaea, wild hyacinth, and vetch. Many of the proposed facilities will be in areas where annual grassland vegetation occurs.

Vernal pools are quite extensive west of the existing runway, surrounded by annual grassland. A base-wide wetland inventory was conducted in 1985 by the USDA SCS. During this survey, all wetlands (including larger vernal pools and riparian wetlands) were classified and mapped.

Vernal pools are small, shallow bodies of water that occupy depressions in grassland and woodland areas. They are filled with water in the winter and are dry in the summer. The bottom of the pool is usually an impervious claypan or bedrock. The vegetation is unique because the plants germinate as aquatic or semi-aquatic, but as the pool dries, they must adapt to terrestrial life and a dry-land environment. Water

stands in the pool throughout most of the rainy winter season, drowning any grassland species that may have been established before the pool was filled. In the summer, the water evaporates, leaving the pool bed baked hard and dry. This desiccation prevents the establishment of most marsh species.

Freshwater marsh vegetation occurs in ponds and ditches that have a relatively permanent supply of water. Marshes at the base contain perennial monocots such as cattail and tule, and scattered trees and shrubs such as willows, cottonwoods, and buttonwillows. Freshwater marsh vegetation intergrades with riparian woodland vegetation in many drainages throughout the base. Riparian woodlands occur along the banks and bottoms of intermittent drainages such as Hutchinson Creek. These woodlands contain a more dense cover of willow, cottonwood, and sycamore trees.

3.5.1.2 Threatened, Endangered, and Sensitive Species

No State or Federally listed plant species (threatened or endangered) are known to occur at or near any of the proposed facilities. Many of the vernal pools, however, may contain Federal candidates such as legene, Red Bluff dwarf rush, and Boggs Lake dodder (Table 3-4).

A vernal pool survey at Beale AFB was conducted by the California Department of Fish and Game (CDFG) in May 1985 (Holland, 1985). Although a suitable habitat for the above listed species was found at the base, no listed plants were observed during this survey. State or Federally listed plants may be present in vernal pools on the base; however, no listed plants are currently known or expected to occur in other wetland or upland habitats on Beale AFB.

Exhaustive surveys for rare plants have not been completed throughout the base. Sensitive species that may occur in vernal pools may only be detected during a springtime botanical survey. Such a survey is being conducted by the Nature Conservancy for pools in the western portion of the base. The report on this survey is expected to be completed in August 1990. However, based on existing information, threatened and endangered species are not expected to be present. The Army Corps of Engineers, which has permitting authority for construction activity in wetlands, will be contacted for permitting requirements before initiating construction activity.

3.5.2 Wildlife Resources

3.5.2.1 General

The open space of Beale AFB allows for high numbers of wildlife species. Portions of Dry Creek/Best Slough and Hutchinson Creek support freshwater aquatic life. The most abundant native habitat at the base is the grassland habitat. However, oak woodland, riparian woodland, vernal pool, and freshwater marsh habitats are also found at the base. No oak woodland or riparian woodland habitats that may support wildlife will be affected by the proposed facilities.

Vernal pools and freshwater marshes on the base provide a seasonal habitat for migrating waterfowl and shorebirds and the open grasslands provide a seasonal habitat

TABLE 3-4

Threatened and Endangered Plant and
Wildlife Species That May Occur in the Vicinity
of Beale AFB, California

	Common Name	Scientific Name	Status ¹ Fed/State
Insects	Valley Elderberry longhorn beetle	<u>Desmocerus</u> <u>californicus</u>	FT/-
Birds	Aleutian Canada goose	<u>Branta canadensis</u> <u>leucopareia</u>	FE/CE
	American peregrine falcon	<u>Falco peregrinus</u> <u>anatum</u>	FE/CE
	Bald eagle	<u>Haliaeetus</u> <u>leucocephalus</u>	FE/CE
Plants	Ahart's dwarf rush	<u>Juncus leiospermus</u> var. <u>ahrtii</u>	C1/-
	Green's legene	<u>Legenere limosa</u>	C2/-
	Hairy Orcutt grass	<u>Orcuttia pilosa</u>	C1/CE
	Red Bluff dwarf rush	<u>Juncus leiospermus</u> var. <u>leiospermus</u>	C2/-

Sources:

Holland, R.F., 1985. Memorandum regarding vernal pools at Beale AFB, California
Department of Fish and Game.
Kobetich, Gail, 1988. Letter regarding endangered species update. U.S. Fish and
Wildlife Service (USFWS), AKT/1-1-88-SP-653.

TABLE 3-4 (cont'd)

STATUS DEFINITIONS:

FE	-	Federal endangered
FT	-	Federal threatened
C1	-	Federal category 1: Taxa for which USFWS has sufficient biological information to support a proposal to list as endangered or threatened.
C2	-	Federal category 2: Taxa for which existing information may warrant listing, but for which substantial biological information to support a proposed rule is lacking.
CE	-	Listed as endangered in California

for raptors. Beale AFB has an ongoing Bird Air Strike Hazard (BASH) program to alleviate the potential for large birds interfering with existing flight operations. This is of particular concern on base in areas west of the runway, where numerous vernal pools, portions of Rock Creek, and other small intermittent drainages have the potential to provide habitat that can support seasonal and migrating bird populations.

Portions of Dry Creek/Best Slough in the vicinity of Beale AFB support a November and December king salmon run. Dry Creek is a perennial stream and is capable of sustaining flows and adequate water quality to support upstream migration of salmon during spawning periods. However, since flow volumes fluctuate with rainfall amounts, the quality of runs can be irregular. The last good run was in 1984 (Personal Communication, John Thomson, Beale AFB, October 1989).

The hilly, more heavily treed, and typically less populated areas in the eastern portion of Beale AFB are used as a winter grazing range by migratory deer herds. The deer migrate from the lower portions of the Sierra Nevada Mountains in the winter months to areas where grasses are more plentiful and weather less severe. During the hot, dry summer months, these deer herds migrate east to higher elevations where cooler, more suitable habitat exists.

3.5.2.2 Threatened, Endangered, and Sensitive Species

No animal or fish species listed as threatened or endangered by the State or Federal government are expected to regularly utilize Beale AFB (Personal Communication, John Thomson, Beale AFB). Several Federally listed bird species could occur at Beale AFB as transients on rare occasions for brief periods of time, including the Aleutian Canada goose, peregrine falcon, and bald eagle (Table 3-4). It has been speculated that the endangered valley elderberry longhorn beetle could occur on the base; however, there are few elderberry trees present to provide suitable habitat.

3.6 ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES

Although Euroamericans may have visited the Beale AFB vicinity as early as 1808, it was not until 1841 that the history of the area was first recorded. The discovery of gold in California in the late 1840s had miners, merchants, and settlers moving into the Yuba and Bear Rivers region, spurring the growth of mining camps, towns, and settlements. Two settlements, Marysville and Cabbage Patch (renamed Waldo), emerged in the early 1850s on the western and eastern edges of the present-day base boundary. Marysville was developed at the navigation head of the Feather River and as the supply center for the northern mines.

Agriculture and cattle ranching were also influenced by the discovery of gold. Grains, particularly wheat, were grown throughout the Central Valley and the Beale area supported a diversity of produce. Agriculture continued until the U.S. Government condemned 86,000 acres from 150 landowners and created Camp Beale in 1942.

Only small portions of Beale AFB have been intensely surveyed to determine potential archaeological or cultural resources present on base. These include: 1) an

extensive survey of a portion of the Dry Creek drainage system in 1960-61 (Miller, 1961); 2) a proposed irrigation project traversing the base in a narrow north-south corridor surveyed in 1981 for the Yuba County Water Agency (Peak, 1981); 3) surveys conducted in 1982 by archaeologists from the U.S. Army Corps of Engineers in anticipation of proposed barracks construction in the cantonment area (Johnson and Kenton, 1982); 4) surveys performed by Peak and Associates in 1983 for portions of the Reeds Creek drainage and a proposed realignment to the west of the existing channel; 5) large portions of the extreme southern portions of the base surveyed in 1987 (Raven, 1987); and 6) ongoing surveys associated with the potential construction of a rail spur through a portion of the north-central area of the base (PAR & Associates, in progress).

To date, a total of 22 archaeological sites has been recorded on the base. Of these 22 recorded sites, nine are prehistoric, eight relate to historic domestic activities, three are bridges, one relates to mining, and one relates to military activities. Most of the sites are discussed in detail by Raven (1987). Several additional sites have been identified by a privately funded study (Maniery, 1989). Table B-1 in Appendix B summarizes the known archaeological sites on the base and indicates whether they fall within the area of potential effect of the present project. This table indicates that two sites on the base have been determined eligible for the National Register, two sites have been recommended as eligible, six sites have been recommended as not eligible, and twelve sites are of undetermined eligibility. Appendix B includes a discussion of the two sites eligible for listing on the National Register.

In addition to the archaeological sites, 108 historic locations on the base have been identified through archival research. Most of these are (or were) structures, but roads, trails, mining ditches, and a cemetery are also identified. Table B-2 in Appendix B summarizes these historic locations.

Archaeological sensitivity for the base has been presented by Raven (1987). This sensitivity analysis provides information on the potential occurrence of archaeological sites on the base that have never been surveyed by an archaeologist. For prehistoric resources, five zones were identified--each zone is expected to contain certain types and densities of resources based on previous surveys near the base. Sensitivity for historic resources was based on historic documents and is discussed above.

The sensitivity zones for prehistoric resources (Figure B-1 in Appendix B) were delineated on the basis of physiographic characteristics believed to influence prehistoric activities and, in turn, the occurrence of certain types of remains. Descriptions of the zones also appear in Appendix B.

3.7 NOISE

Aircraft operations at Beale AFB produce noise, which results in both direct effects (annoyance, health effects, and impact on domestic animals) and indirect effects (land use) to the surrounding community. Ground noise levels generated by aircraft activity at Beale AFB are estimated using the NOISEMAP computer program (Beckmann and Seidman, 1978). NOISEMAP results are expressed in terms of

average day/night sound levels (L_{dn}) using decibels (dB) on an A-weighted scale as units. The A-scale gives a good approximation of the human ear's response to noise and also correlates well with a person's judgement of the loudness of a noise event (EPA, 1974). L_{dn} values are used by the Environmental Protection Agency (EPA), U.S. Department of Housing and Urban Development (HUD), and the DOD to describe noise exposure. In calculating L_{dn} levels, noises that occur between 2200 hours and 0700 hours are penalized by adding 10 dB to their actual noise levels. This penalty accounts for the fact that noises occurring at night are usually judged to be more annoying than those occurring during the day. A more detailed description of the noise metrics used in this analysis is given in Appendix C.

The noise levels estimated by NOISEMAP are based on the flight parameters of the aircraft, including the engine type, altitude, and throttle setting, and on the aircraft type, flight path, and profile utilization. These input data were gathered in 1989. The data were in turn entered into a central computer at the Air Force Engineering Services Center at Tyndale AFB, Florida. The NOISEMAP program calculates L_{dn} values in decibels and plots a map of the noise "footprints" or contours. Noise contours are plotted with a minimum L_{dn} value of 65 dB because studies have determined that the percentage of persons highly annoyed by noise exposure increases rapidly above this level. Also, HUD has adopted a L_{dn} value of 65 dB as the upper limit of acceptable noise for residential development and the FAA uses a L_{dn} value of 65 dB to define residential noise impact areas around airports. Documentation on the NOISEMAP program is located in Appendix C.

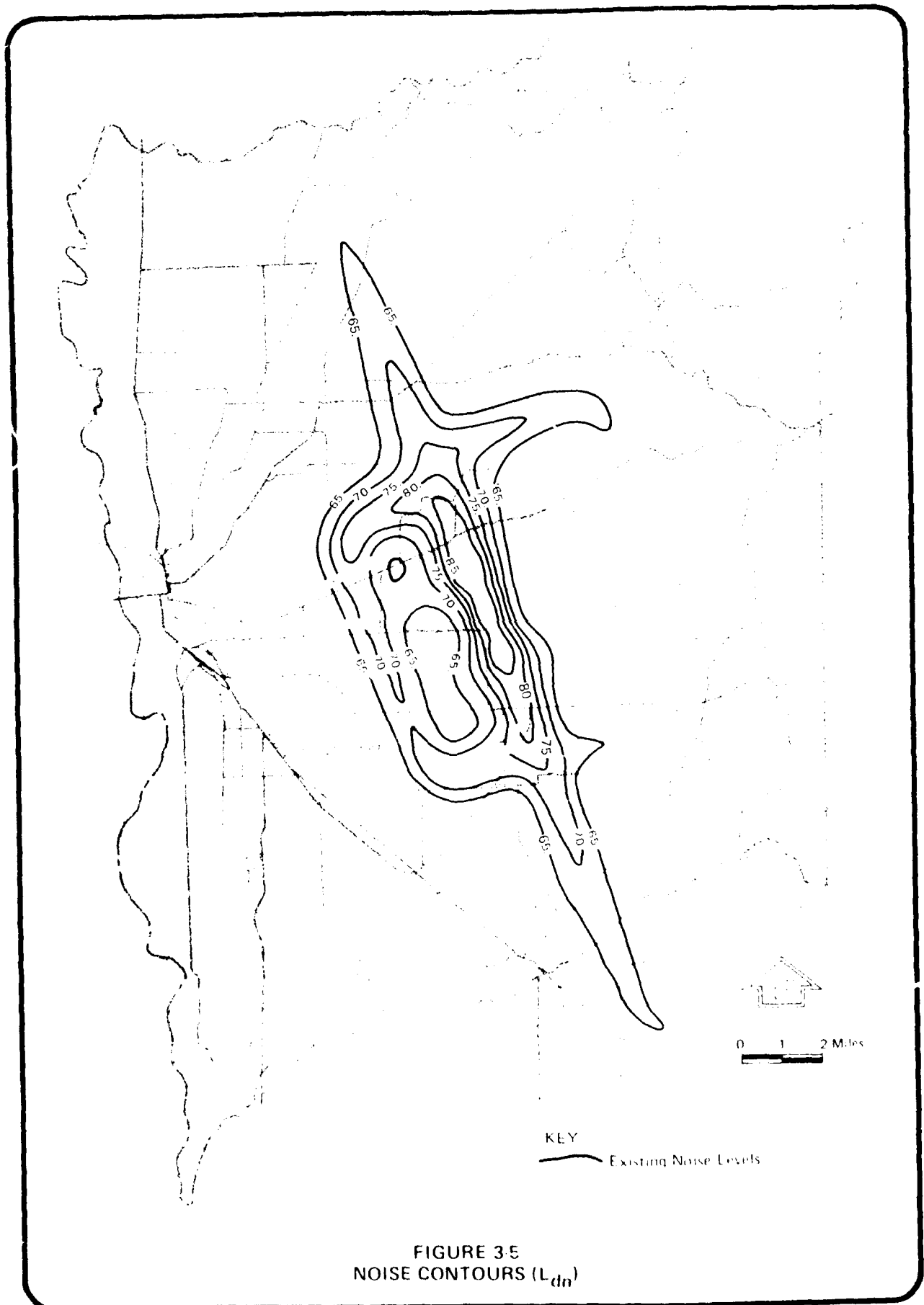
3.7.1 Existing Noise Conditions

Noise contours for Beale AFB are based on the average busy day, existing and planned future peacetime levels of activity and the assumption that future military aircraft will not be noisier than existing military aircraft. Figure 3-5 presents L_{dn} noise contours at Beale AFB under current operations. The noise contours shown in Figure 3-5 take into account the recent deactivation of the SR-71 program at the base.

Noise complaints received by Beale AFB in 1988 were overwhelmingly attributed to sonic booms caused by SR-71 aircraft. It was estimated that 95 percent of the 217 complaints in that year were of noise related to that aircraft. (USAF, HQ SAC, 1990).

Air traffic patterns for Beale AFB are established according to Air Force directives, with safety and noise abatement considerations foremost. When flights over populated areas cannot be avoided, procedures are established to minimize the inconvenience to those living in the affected areas. Prevailing winds are from the south about 90 percent of the time; thus, the majority of takeoffs are toward the south. The majority of the flying activity takes place west of the airfield and is regulated to a southeasterly flow. This means that most takeoffs are toward sparsely populated rural areas in Yuba and Placer Counties. The northern patterns also fly over sparsely populated areas.

Flying operations at Beale AFB are evaluated continuously to maintain noise levels at a minimum. Practice takeoffs and landings and instrument approaches are normally conducted at times when people are not sleeping, and usually are not



scheduled between 2200 and 0600 hours. During evening hours, only mission-essential aircraft arrivals and departures occur. Also, traffic patterns are located away from population centers, and normal runup activities are not performed after 2200 hours or before 0600 hours. Engine runup locations have been established in areas of minimized noise exposure for people on the base, as well as those in the surrounding community. Blast deflectors are used to reduce noise where the runup blast is directed toward the base boundary. Normal base operations do not include nighttime runups, but heavy workloads or unforeseen contingencies sometimes require a limited number of nighttime engine runups.

3.8 LAND USES

Beale AFB is located entirely within the boundaries of Yuba County. Approximately 74 percent of the land area in the county is dedicated to farming and grazing (EDAW, 1988; Cal DOF, 1988). The land bordering the base is primarily agricultural. A Comprehensive Land Use Plan (CLUP) for Beale AFB was prepared by the Sacramento Area Council of Governments (SACOG, 1987), acting as the regional Airport Land Use Commission under authority of the Airport Land Use Commission Law (Article 3.5, California Public Utilities Code). The CLUP characterizes the existing land uses around the base as mostly agricultural lands supporting irrigated crops, such as rice, alfalfa, safflower, and corn; and deciduous trees that produce peaches, prunes, and almonds, or rural residential mixed with open space recreation areas. In addition to adjacent agricultural lands, extractive mineral operations occur to the north of the base adjacent to the Yuba River in an area known as the Yuba Gold Fields.

SACOG considers the existing land uses around the base to be consistent with the CLUP, which is based on flight safety, ground safety, and noise criteria. The plan was prepared to protect Beale AFB from incompatible uses of neighboring land; provide for the orderly growth of the area surrounding the base; safeguard the general welfare of the inhabitants within the vicinity of the airport and the general public against adverse effects of aircraft noise; reduce the number of people exposed to airport related hazards; and ensure that no structures affect navigable air space. Planned land uses in the vicinity of the base, as described in the Yuba County General Plan, are characterized as being generally consistent with the CLUP.

The maximum exterior noise exposure of noise-sensitive land uses should not exceed an L_{50} level of 65 dB under the noise criteria contained in the CLUP. A range of acceptable noise levels for land uses that are not noise-sensitive has also been established. Appendix C provides more detail on noise.

3.8.1 Accident Potential

The base has one runway, which is 12,000 feet long and 300 feet wide. There are asphalt overruns of 1,000 feet on the south and 2,250 feet on the north. The runway is capable of handling any aircraft in the Air Force inventory.

The Air Force maintains 3,000-foot by 3,000-foot Clear Zones (CZ) at each end of the runway because of the high accident potential in these areas. Within the CZ,

land use restrictions prohibit economic use of the land. Accident Potential Zones (APZ) are less critical than the CZ, but still possess potential for accidents. APZ I are 3,000 feet by 5,000 feet areas adjacent to the Clear Zones. APZ II are 3,000 by 7,000 feet areas adjacent to APZ I. These three zones (CZ, APZ I, and APZ II) combine to form an area that extends to 15,000 feet from the runway threshold.

The Air Force controls activity in the Clear Zones. Through the Air Installation Compatible Use Zone (AICUZ) program, the Air Force provides guidelines on compatible land use within APZs to local agencies. (USAF, 1984). A 1,000-foot Safety Zone on each side of the runway center line, a 200-foot Safety Zone from the center of each taxiway, and a 125-foot minimum Safety Zone from outside the aprons are also maintained. No incompatible land use is reported within the CZ, APZ I, or APZ II at Beale AFB (USAF, 1984).

3.8.2 Height and Obstruction Criteria

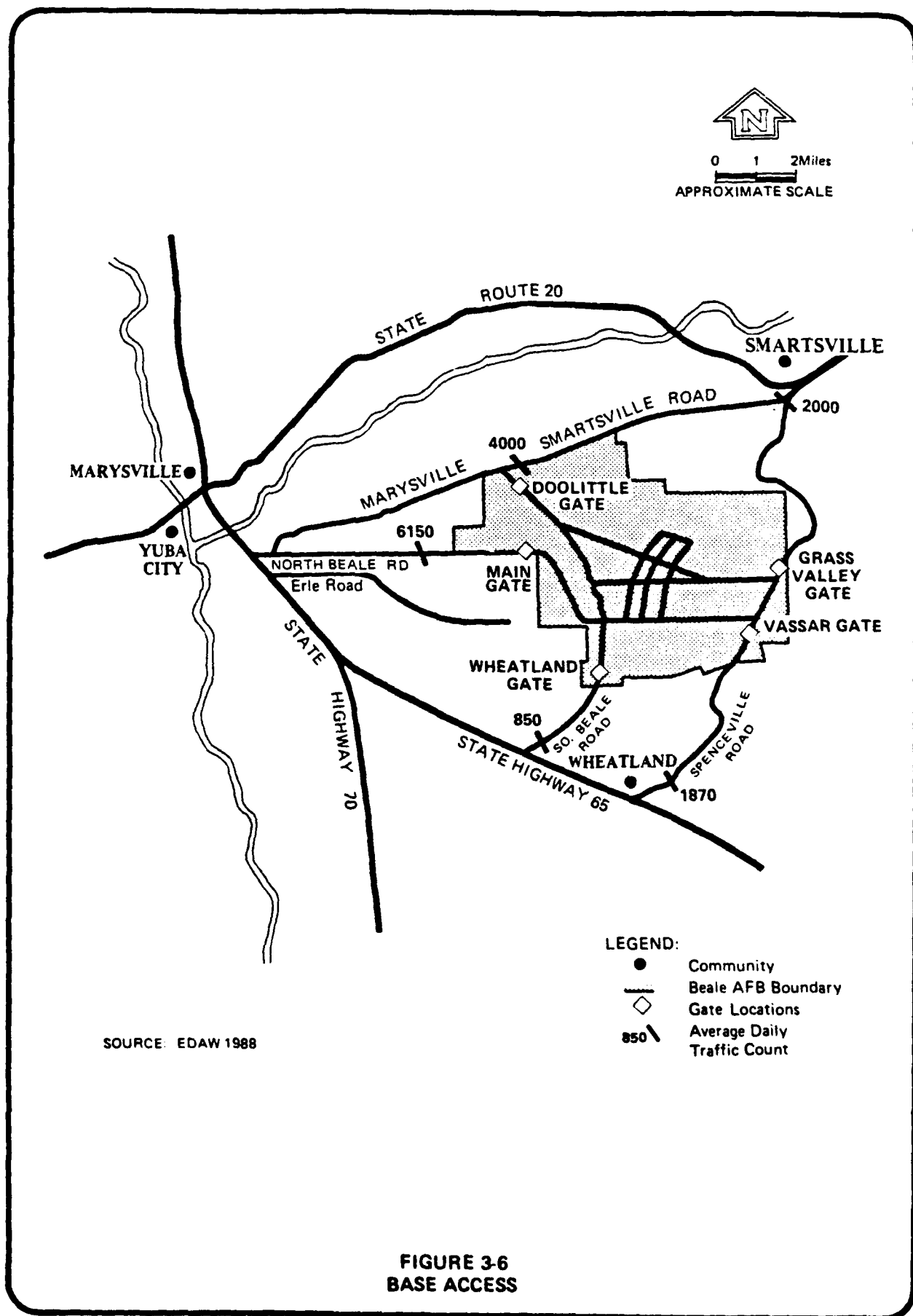
In addition to accident potential and noise, the AICUZ plan also addresses height and obstruction criteria for areas in the vicinity of airfields. These criteria, established by the USAF and FAA, are concerned with the following land use activities: release into the air of any substances that would impair visibility or otherwise interfere with pilot vision; production of electrical emissions that would interfere with aircraft communication and navigation systems; attraction of birds or waterfowl; and placement of any type of natural or artificial object at a location and height that would interfere with approaches and departures of aircraft. The State of California prohibits construction of any structure that constitutes a hazard to air navigation (unless the California Department of Transportation issues a permit). These obstruction criteria have also been incorporated into the zoning laws of Yuba County.

3.9 TRANSPORTATION

In December 1987, a traffic study of Beale AFB was conducted as part of an effort to revise the Base Comprehensive Plan. Most of the quantifiable information about transportation conditions on and around the base is drawn from this study and, therefore, reflects specific conditions in December 1987.

3.9.1 Access

There are five gates providing access to Beale AFB--the Main Gate on the west, Doolittle and Grass Valley Gates on the north, and Wheatland and Vasser Gates on the south. Travel to and from the base occurs on a combination of State highways and county roads, including State Highways 65 and 70, State Route 20, North Beale Road, South Beale Road, Marysville Smartsville Road, and Spencerville Road. The locations of the gates and roads are indicated on Figure 3-6. The relatively low traffic volumes on all except North Beale Road make it difficult for the access routes to become high priorities for upgrading by the county. Daily traffic counts on or adjacent to the access roads range from 850 on South Beale to 6,150 on North Beale Road.



Traffic counts at each gate during morning and afternoon peak periods are presented in Table 3-5. The Main and Doolittle Gates are the busiest while the Grass Valley Gate is the least busy during these peak periods. Doolittle Gate has the highest peak hour traffic (520 vehicles) and the highest 15-minute inbound traffic flow observed (192 vehicles). Backups of traffic occur there due to uneven distribution of arrivals and security checks of some cars.

Vehicle traffic to and from the base is generated by five major user groups: (1) military personnel residing off base; (2) civilian employees working on base; (3) retired military personnel; (4) commercial traffic; and (5) visitors. Visitors generally use the Main Gate since it is always open and is the closest gate to the major urban center in the area. Commercial truck traffic generally arrives from the south and favors either Wheatland or Main Gates. Military personnel residing off-base, civilian employees, and military retirees use all of the gates. Their choice depends on their off-base location and on-base destination.

3.9.2 On-Base Roads

The road system on the base consists entirely of two-lane roadways. Capacity problems can result at intersections where significant left-turn movements occur on either minor or major streets. No left-turn lanes have been created to reduce such delays. At four locations, an auxiliary lane has been added on the outside of the roadway to enable through-traffic to maneuver to the right and pass traffic waiting to turn left. They are located on Gavin Mandery at intersections with A, C, and J Streets, and on Warren Shingle at the hospital entrance.

The ability of a road system to accommodate traffic demand in built-up areas typically is governed by the capacity of its intersections. Traffic exceeds intersection capacity on at least one approach per day at six intersections. All instances of capacity exceedance are for left turns or for through-movement on minor streets.

Four major base parking lots were analyzed as input to the development of the Base Comprehensive Plan (EDAW, 1988); two in the cantonment area (the Commissary and Base Exchange lots), and two in the flightline area on either side of Douglas Road (Douglas Road north and south). Table 3-6 presents information on the use of these lots. Based on the information in this table, the Douglas Road southern lot is slightly over capacity in the morning, apparently due to user preference for this lot over the northern lot. Other than this, adequate parking exists in these two areas of the base.

3.9.3 Bus Operations

The base operates a shuttle bus from 0600 to 1700 hours for the primary purpose of providing transportation to work locations for military personnel without personal transportation. Military dependents are able to ride on a space-available basis. The local public transit system, Hub Area Transit System, operates a route between Beale AFB and Marysville during the summer to serve an employment training program. Bus occupancy on this route was not great enough to justify year-round service.

TABLE 3-5
Gate Traffic Volumes at Beale AFB

	Gates				Total
	Main Gate	Doolittle Gate	Vassar Gate	Wheatland Gate	
Morning Peak Period Traffic					
Peak Period (0600 to 0900)					
Volume	900	742	264	424	2,476
Percent of Volume for all Gates	36	30	11	17	100
Peak Hour					
Time of Occurrence	0630 to 0730	0630 to 0730	0715 to 0815	0630 to 0730	1,344
Volume	85	520	126	239	100
Percent of Volume for all Gates	29	39	9	18	91
Percent Inbound at Each Gate	86	92	57	96	54
Peak Hour as Percent of Peak Period at Each Gate	43	70	48	56	
Afternoon Peak Period Traffic					
Peak Period (1500 to 1800)					
Volume	1,300	819	297	405	2,997
Percent of Volume for all Gates	43	27	10	14	100
Peak Hour					
Time of Occurrence	1600 to 1700	1545 to 1645	1700 to 1800	1600 to 1700	1,362
Volume	544	455	109	174	100
Percent of Volume for all Gates	40	33	8	13	81
Percent Inbound at Each Gate	76	90	50	90	46
Peak Hour as Percent of Peak Period at Each Gate	42	56	37	43	

Source: EDAP 1988
Note: Data collected on Thursday, 3 December, 1987.

TABLE 3-6

Utilization of Major Base Parking Lots

<u>Lot</u>	<u>Available Spaces</u>	<u>Weekday Time</u>	<u>Spaces Filled</u>	<u>Percent Filled</u>
Commissary	225	1100 1700	187 152	83 68
Base Exchange	272	1100 1700	152 43	56 16
Douglas Road North	318	1000 1400	151 132	48 42
Douglas Road South	276	1000 1400	280 237	101 86
TOTAL	1091	Morning Afternoon	770 564	71 52

Source: EDAW 1988.

Note: Data collected in December 1987.

3.9.4 Railroad

The base railroad service, an extension of commercial tracks, enters the base on the east side of South Beale Road and terminates in a switching yard east of J Street between 6th Street (Gavin Mandery) and 14th Street (Warren Shingle). The service's primary function is to transport aviation fuel to the storage tanks located in this area, but occasional munitions shipments are also handled. Fuel deliveries are made three days a week. A minimum of eight locomotive trips across Gavin Mandery are required for each fuel delivery. For large deliveries, an additional eight locomotive movements are required.

3.10 UTILITIES

3.10.1 Electric Supply

Electric service is provided to Beale AFB at 60 kilovolts (kV) from the Western Area Power Administration and transmitted from their facilities over Pacific Gas & Electric (PG&E) lines to Grass Valley Substation. The base then distributes 60 kV to a number of substations on base where the voltage is stepped down to 12 kV and distributed. The electrical system is considered extremely reliable, with only one to two short duration outages per year (PAT, 1989).

3.10.2 Water Supply

The water distribution system at Beale AFB originates at the wellfield located on base approximately 1 mile east of the Main Gate (Figure 3-7). The field is composed of eight active wells whose collective capacities are 7,750 gallons per minute (gpm) or 11.16 million gallons per day (mgd) (EDAW, 1988). Water from the wells is treated at the adjacent water treatment plant and then pumped through an 18-inch transmission line to the main line booster station south of the flightline area. This transmission line is an approximately 50-year old spiral well casing, and is suffering corrosion failure. It will be programmed for replacement. From the main booster station, water is pumped to a 250,000-gallon elevated storage tank located near the flightline area, and to the 3,000,000-gallon main storage reservoir northeast of the cantonment area that feeds three other separate storage facilities. Total water storage capacity for the base is 5.2 million gallons.

The water supply is adequate to meet present and future needs; however, the water treatment and distribution system will need some improvement (PAT, 1989). Current groundwater usage at Beale AFB varies from 2.5 mgd in the winter to 6.0 mgd in the summer; the large variation in usage is due to high irrigation demand in the dry months. These usage figures are assuming an average daily base population of approximately 10,000 people, including military personnel, dependents, civilian workers, base contract personnel, retired personnel taking advantage of base facilities, and other visitors (Personal Communication, Mr. Tony Guerrero, Manager, Water Treatment and Water Supply, Beale, AFB, 1989).

The water supply to the housing area is adequate to meet substantial growth, but additional delivery demands will probably require additional and backup booster

Vernal pools and freshwater marshes on the base provide a seasonal habitat for migrating waterfowl and shorebirds and the open grasslands provide a seasonal habitat

3-17

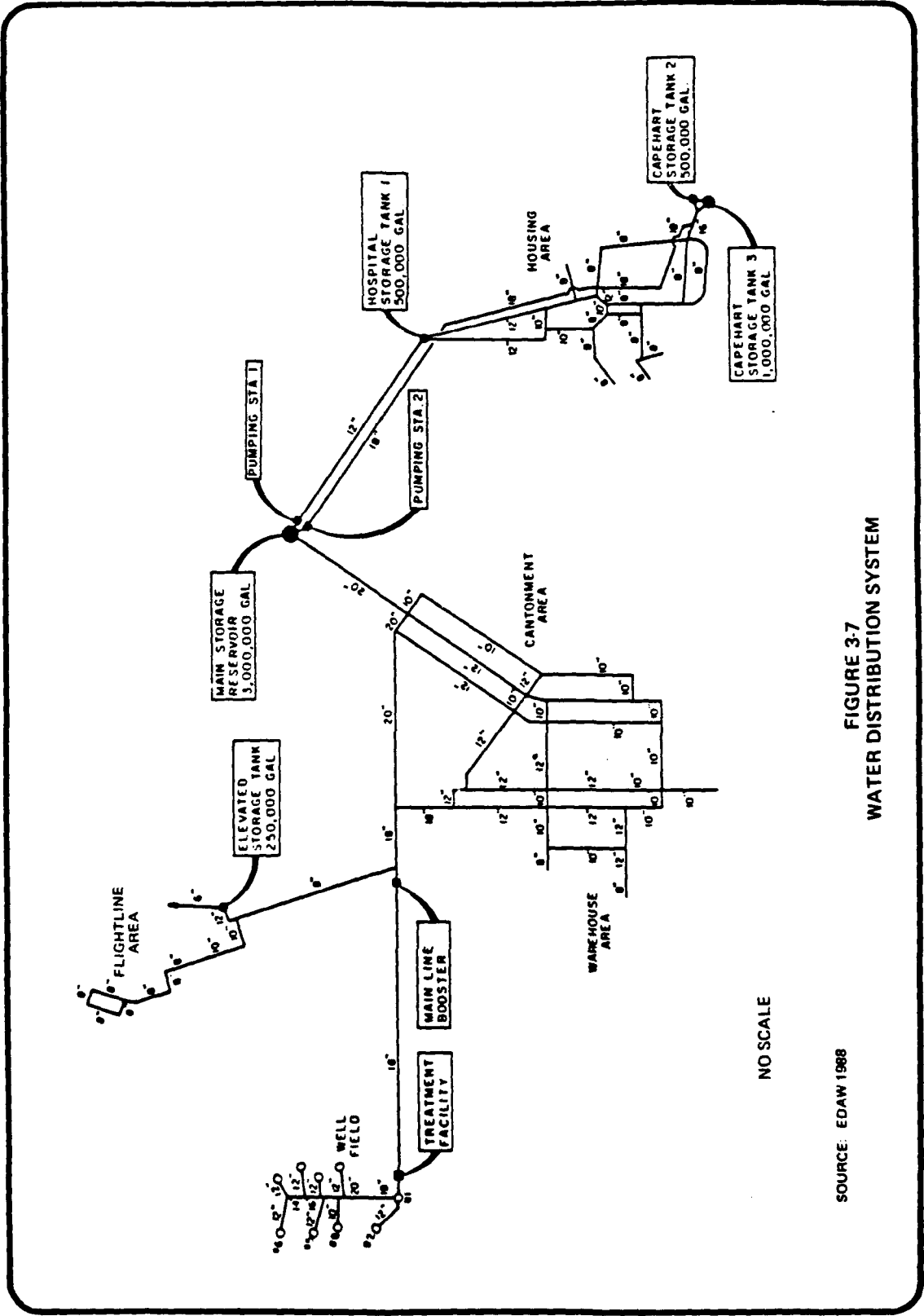


FIGURE 3-7
WATER DISTRIBUTION SYSTEM

SOURCE: ED&W 1988

pumps. The water supply and delivery system in the cantonment area is adequate to meet present and future needs. The water supply to the flightline area is also adequate.

The water treatment includes injection of chlorine and fluoride. The water is not filtered at the treatment plant, although some wells are equipped with sand separators. The water treatment plant treats approximately 2 mgd during the winter months and up to 6.5 mgd in the summer months. The estimated capacity of the plant is 7 mgd. There is no treatment for manganese levels (see Section 3.4.3.1). In addition to the distribution system on base, reclaimed water from the wastewater treatment plant is pumped to the golf course for irrigation through a separate water line.

3.10.3 Communication

Commercial communications services are provided to the base by Pacific Bell and the American Telephone and Telegraph Company. The existing base communication system is at absolute maximum capacity and the 1883rd Communication Squadron is presently evaluating proposals for completely replacing the existing system with a new Base Information Digital Distribution System (BIDDS). The BIDDS will include a fiber optic cable system and a digital switch that will support a complete state-of-the-art communications system and will ultimately allow complete computer networking. The BIDDS will ultimately have the capacity to serve the present base load, the relocated SUNT load, and have spare capacity for 5 to 10 years projected growth. The new BIDDS will be government-owned, contractor installed and contractor maintained (PAT, 1989). It is anticipated that the BIDDS System will be installed and operational prior to the end of FY 1993 when the SUNT becomes fully operational at Beale AFB.

3.11 WASTE MANAGEMENT

3.11.1 Solid Waste Disposal

Solid waste from base operations and households is disposed of in a sanitary landfill located on the southern portion of the base, between the cantonment area and the family housing area. Vehicles enter the landfill from Gavin Mandery Road. This landfill, occupying about 40 acres, has been in use since 1981, and is permitted by the State as a Class III (nonhazardous) landfill. The landfill has an estimated total capacity of approximately 3,795,000 cubic yards (cy), of which approximately 845,000 cy are used. The current usage rate is approximately 5,219 cy per month or 62,628 cy per year. At this current rate of use, the landfill has an estimated remaining lifetime of 35 to 40 years (Personal Communication, Mr. Greg Miller, Beale AFB, September, 1989).

Waste deposited there is primarily general refuse. Landfill operations consist of trench method disposal, and water runoff and runoff controls are present. Management practices include no chemical disposal and daily coverage of the waste. A landfill study has been accomplished under the Installation Restoration Program that complied with the California Solid Waste Assessment test. The results of this study

indicate that no groundwater contamination or contaminated leachate emanated from the landfill (Aerovironment, 1987).

3.11.2 Wastewater Disposal

The sanitary sewer system at Beale AFB is primarily a gravity flow system. However, two lift stations are required to pump flightline wastewater up a slight grade to the STP located in the southwestern portion of the base. The STP is designed to treat 5.0 mgd, and currently receives an average of approximately 1.0 mgd.

The sanitary sewer system services the three main areas of the base, the family housing area (including the Hospital and PAVE PAWS), the cantonment area, and the flightline area. Approximately 97 percent of the flow entering the STP originate from these areas. The remaining 3 percent of the flow is from the Precision Photo Lab.

Precision Photo Lab wastes are collected in a wet well and pumped through an underground line to the photo wastewater treatment plant. Discharge from this pretreatment system combines with sanitary sewage prior to entering the STP.

A cease-and-desist order was issued by the CRWQCB because discharge limitations stated by the NPDES permit were being exceeded. There were high levels of boron and cyanide in the effluent along with a foaming problem upon discharge to Hutchinson Creek. The boron and cyanide come primarily from the Precision Photo Lab wastewater that enters the sewage treatment facility. To correct these problems, an evaporation unit has been installed at the photo lab that pretreats the chemical solutions used in developing film prior to its entering the photo wastewater treatment plant. It handles approximately 700 gallons per day. The evaporation unit reduces the amount of sludge entering the photo wastewater treatment plant from the film developing process. This sludge is placed directly in barrels at the photo lab and disposed of in accordance with hazardous waste regulations. Approximately 3 to 5 barrels (55 gallons each) of sludge were generated each month prior to installation of the evaporation unit. The photo washwater, approximately 20,000 to 25,000 gallons per day, is discharged directly into the photo wastewater treatment plant.

Primary and secondary treatment at the STP includes a grit chamber, two clarifiers, two trickling filters, two anaerobic digestors, one chlorine contact chamber and an aeration pond. The effluent from the STP normally enters Hutchinson Creek in accordance with a NPDES permit issued by the CRWQCB (permit No. CA0110299). However, during times of low flow in the creek, a major portion of the treatment plant effluent is diverted to the golf course equalization pond where it is used for irrigation. Non-hazardous solids from the anaerobic digestors are taken to the base landfill for disposal.

3.11.3 Hazardous Waste Generation and Disposal

Beale AFB has five accumulation areas for containerized hazardous wastes. Site managers have the responsibility of maintaining and inspecting the accumulation sites and the generation sites. These managers generally transport wastes from the generation points to the accumulation sites on a weekly basis. All waste oils and fluids

are either placed into drums or directly into aboveground or underground storage tanks. All waste oils are then sold to a local waste oil contractor. Drummed wastes are transported to the Central Storage Facility prior to removal by the Defense Reutilization and Marketing Office at McClellan AFB, California. Beale AFB is required to report generation totals to the Region IX office of the U.S. Environmental Protection Agency and the State of California Department of Health Services biennially for the preceding calendar year. The base is also required to report hazardous waste management spending to HQ SAC each fiscal year. All of these reports are sources of information for types and quantities of hazardous wastes generated by base operations. Annual forecasted quantities of wastes generated at Beale AFB are presented in Table 3-7 by category.

3.11.4 Beale AFB Installation Restoration Program

The Installation Restoration Program (IRP) is a product of DOD policy. This policy, directed by Defense Environment Quality Program Policy Memorandum 81-5, has three objectives. The first is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DOD facilities; second, to control the migration of hazardous contamination from such facilities; and third, to control hazards to health and welfare that may have resulted from these past operations. The legal mandate for the USAF IRP is the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund) and the Superfund Amendments and Reauthorization Act (SARA).

The IRP is a three-phase program designed to ensure that identification, confirmation and quantification, and remedial actions are performed in a timely and cost-effective manner. The phases are as follows:

- Preliminary Assessment/Site Inspection.
- Remedial Investigation/Feasibility Study.
- Remedial Design/Remedial Action.

Beale AFB currently has 24 IRP sites. Figure 3-8 shows the general location of these sites. The sites include four landfills, three fuel spill areas, two aboveground fuel storage areas, two sites associated with photographic wastewater treatment, two engine test cells, two pesticide/herbicide buildings, one fire training area, and eight other sites of various types. One of these miscellaneous sites is actually a wide area of the base where over 750 abandoned underground storage tanks are suspected. Table 3-8 lists the 24 IRP sites, a brief description of each site, and the waste types suspected for each site. None of these sites nor any other portion of Beale AFB has been listed or proposed for listing on the National Priorities List (40 CFR 300 Appendix B and Federal Register Vol. 54 and 55).

A major field investigation of all 24 sites was recently completed. This work and an earlier study represent the bulk of the remedial investigation activities that are expected to occur on the base. No further action is recommended at five sites at this time. Additional investigation will be required at a dozen sites and monitoring of conditions will continue at 15 sites. Five sites are ready for feasibility studies and seven

TABLE 3-7

Annual Forecasted Quantities of Wastes Generated
At Beale AFB

<u>Product</u>	<u>Total (Gal/Yr)</u>	<u>Percent of Total</u>	<u>Total Drummed (Gal/Yr)</u>	<u>Percent of Total Drummed</u>
Paint & Thinners	1,572	2.49	792	7.61
Strippers	474	0.75	462	4.44
Acids	11,820	18.71	0	0
Soaps	3,172	5.02	60	0.58
Oils & Fluids	13,077	20.70	0	0
Solvents & Degreasants	4,541	7.19	2,004	19.25
Photo & NDI Chemicals	20,054	31.74	530	5.09
Fuel	4,462	7.06	4,242	40.75
Miscellaneous Chemicals	4,012	6.35	2,320	22.29
TOTALS	63,184¹	100	10,410	100

Source: Wastewater Characterization/Hazardous Waste Survey, Beale AFB, CA January, 1989. USAF OEHL Report 89-003EQ0013ASC.

Note: ¹Modified to correct mathematical error in source.

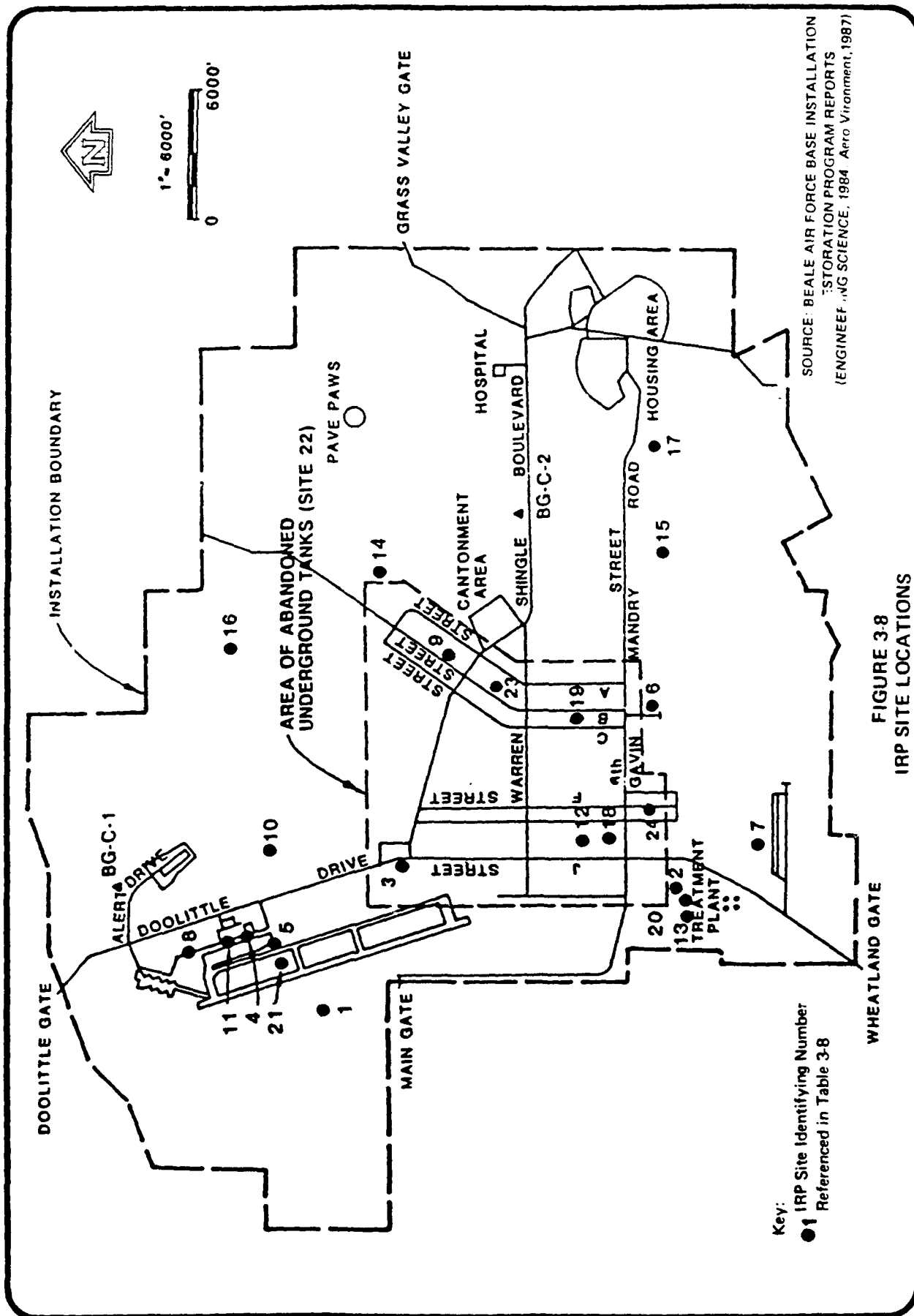


TABLE 3-8

Beale AFB IRP Sites Summary

Reference Number in Figure 3-8	USAF Site Identification Number	Site Name	Description	Potential Waste Types
1	SD-01	West Drainage Ditch	Receives surface runoff from flightline and runway area.	Jet fuel, oil, solvents
2	WP-02	Photo Wastewater Treatment Plant (PWTP), Injection Wells, and Sludge Basins	Physical and chemical treatment of photo processing wastewater. Between 1966 and 1986, PWTP effluent was discharged into three injection wells. Since 1974, two unlined sludge ponds have been used for drying PWTP clarifier sludge.	Pentachlorophenol, photo processing chemicals, trace metals, phenolics, benzene, oil and grease, chromium
3	FT-04	Fire Protection Training Areas	Fire prevention training exercises have been conducted in two areas approximately 200 feet apart. Waste oils, spent solvents, and aviation fuels were applied to the ground and ignited. There are two 25,000-gallon underground storage tanks in the area.	Waste oils, solvents, jet fuel
4	WP-05	Battery Shop Dry Well	Twenty-four gallons per month of neutralized lead-acid battery wastes were discharged to this dry well adjacent to the battery shop.	Neutralized battery acid (lead and organic compounds)
5	SD-06	SR-71 Shelter Drainage	Three hundred gallons per week of JP-7 jet fuel leaks onto hangar floors and shelter apron area. JP-7 jet fuel drains partly to an oil water separator and partly to the soil and gravel area between SR-71 shelter and flightline.	Jet fuel, solvents

TABLE 3-8 (cont'd)

Reference Number in Figure 3-8	USAF Site Identification Number	Site Name	Description	Potential Waste Types
6	LF-07	Landfill No. 2	The landfill occupies 56 acres and was used for refuse disposal between the early 1950s and 1980. In addition, approximately 380 cubic yards of sludge from PWTP (Site 2) and small amounts of petroleum and chemicals were also disposed here. Currently used for construction and grounds maintenance debris.	Domestic and base refuse, PWTP sludge, chemicals
7	SD-08	Army Biological Production Area	Area used for biological test site of wheat stem rust. Stock was incinerated and plowed into soil.	Freon, ethylene dioxide, metals, trichloroethylene (TCE)
8	SD-09	J-57 Test Cell	Jet aircraft engines tested here. Soils were stained in drainage ditch.	Jet fuel, petroleum distillates, soaps
9	SD-10	Entomology Building 2560	Gravel basin received drainage from pesticides and herbicides stored and mixed. Pesticide containers are also rinsed here.	Pesticides, herbicides
10	SD-11	J-58 Test Cell	SR-71 aircraft engines tested here. Soils are stained in drainage ditch.	Jet fuel, petroleum distillates, soaps, oil, TCE
11	SD-12	Aircraft Ground Equipment Maintenance Area	Aircraft ground support vehicles are known to leak oil and hydraulic fluids. Soils are stained in the ditch receiving drainage from support vehicles parking lot.	Oil, hydraulic fluid, fuel (gasoline)
12	WP-13	Entomology Building 440	Pesticides and herbicides were stored and mixed in and around the building.	Pesticides, herbicides

TABLE 3-8 (cont'd)

Reference Number in Figure 3-2	USAF Site Identification Number	Site Name	Description	Potential Waste Types
13	LF-14	Landfill No. 1	This landfill occupies 4 acres and received refuse in the 1940s. The source and composition of wastes is unknown. The site is no longer in use.	Unknown
14	SD-15	Transformer Drainage Pit	Between 1977 and 1979 transformers were drained here before repair.	Transformer oil, PCBs
15	LF-16	Landfill No. 3	This landfill occupies a 40-acre site. It has been in operation since 1981 and accepts domestic garbage and refuse.	Domestic garbage and refuse
16	WP-24	Explosive Ordnance Disposal Area	Unused ordnances are detonated in two bunkers or in an open field in this area. Diesel fuel and wood are used to burn smaller ordnances. The burned metal portion of the ordnances are placed in a trench.	Detonated munitions, explosives, flares, and pyrotechnics debris
17	OT-20	Best Slough	Empty drums were found in area	Unknown
18	ST-22	Bulk Fuel Storage Facility	Diked above ground fuel storage tanks.	Jet fuel, diesel fuel
19	DP-17	Photo Waste Emergency Holding Basin	During overflow conditions photo wastes are diverted to this holding basin with compacted clay bottom and cement sides.	PCP-treated photo wastewater
20	WP-19	Grease Pit (Sanitary Treatment Plant)	Unlined pit used to disposal sewage plant clarifier skimmings.	Oil and grease, organic solvents
21	ST-26	JP-7 Aboveground Fuel Storage Tanks (Flightline)	Diked aboveground fuel storage tanks.	Jet fuel

TABLE 3-8 (cont'd)

Reference Number in Figure 3-8	USAF Site Identification Number	Site Name	Description	Potential Waste Types
22	ST-23	Abandoned Underground Storage Tanks	Old base area maps show 753 abandoned underground storage tanks in the area previously occupied by Camp Beale.	Fuel oil, gasoline
23	SD-25	Ninth Transportation Shop	Repair shop and parking area for refueling trucks.	Jet fuel, diesel, oils
24	LF-21	Landfill No. 4	Trench fill 1960s-1970s. Contents unknown.	Demolition debris, domestic refuse

CH2M Hill, 1990.

Source: ST = Underground tanks; tanks; petroleum, oil, and lubricant lines

Notes:

LF = Landfills

DP = Disposal pits

WP = Waste pits, sumps, lagoons, waste treatment, evaporation pits

FT = Fire training area

SD = Surface runoff, wash racks, ditches, oil/water separators

OT = Other, ordnance, burn areas, buildings

for risk assessments. After these additional investigations, studies, and assessments are completed remedial design and action can proceed.

3.11.5 Underground Storage Tanks

There were approximately 750 underground storage tanks that stored fuel oil and gasoline in the area of Beale AFB previously occupied by Camp Beale. It is not known whether they were emptied or removed when the Army closed the camp. Camp Beale records suggest that these tanks were located within an area identified as Site 22 of the ongoing IRP. This area is shown on Figure 3-8. A review of 1943 maps of Camp Beale indicated that there were a total of 38 gasoline USTs with capacities between 5,500 and 12,000 gallons, and 715 fuel oil USTs ranging in size between 265 and 12,000 gallons.

Limited investigations to determine the presence of USTs have been conducted within the cantonment area affected by the construction of the Academic Complex. The results of the investigations indicated several magnetic anomalies that could possibly be USTs. However, ground truthing activities to confirm the results of the investigation will be conducted.

3.11.6 Asbestos

Initial inspection of facilities on base for the presence of suspected asbestos-containing material has been performed, but no sampling survey to confirm the presence of asbestos has been completed. A summary of available information on asbestos in buildings planned for demolition or renovation has been assembled from the base's asbestos registry and is presented in Table 3-9. Prior to demolition or renovation activities, a survey will be conducted to confirm the presence or absence of asbestos. If asbestos is present, appropriate remedial actions will be implemented.

3.12 SOCIOECONOMIC FACTORS

Socioeconomic factors are described in a geographical context comprising primarily Yuba County, but also taking account of the surrounding region, as appropriate. Many of the military and civilian personnel of Beale AFB reside off base in Yuba, as well as in the neighboring counties of Sutter, Butte, Nevada, and Placer. A few reside as far away as Sacramento and its suburbs. The buying power of the personnel employed at Beale AFB is a major factor in the region's economic health.

3.12.1 Demographics

Population estimates for Yuba and Sutter Counties are presented in Table 3-10. Yuba County has experienced a modest growth trend of between 1.7 percent and 2 percent per year since 1950. The Yuba and Sutter County population is projected to grow less rapidly (1.4 percent annually) than the State as a whole over the next several years.

TABLE 3-9
Summary of Asbestos Registry for Buildings Planned
or Considered for Demolition or Modification

Building	Results of Initial Inspection	Type of Material Sampled	Result of Analysis
2195 Commissary Warehouse	No entry in registry	Pipe insulation	3 samples contained asbestos ranging from 2 to 24%, one sample did not contain asbestos.
2193 Hazardous Material Storage Facility	No entry in registry	No samples taken	NA
2196 High Voltage Electrical Switching Station	No entry in registry	No samples taken	NA
2174 Decontamination Facility	Suspected material throughout, suspected material in exterior wall, none friable.	No samples taken	NA
2175 Dormitory	Suspected material throughout, suspected material in exterior wall, none friable.	Boiler tank insulation	5% asbestos
2176 Dormitory	Suspected material throughout, suspected material in exterior wall, none friable.	Boiler tank insulation	5% asbestos
2177 Dormitory	Suspected material throughout, suspected material in exterior wall, none friable.	Boiler tank insulation	5 to 10% asbestos
2195 MWR Rental and Zone C Operations	Suspected material in exterior wall.	Boiler tank insulation, stack cover, return line insulation, and fire door.	4 samples contained asbestos ranging from 8 to 30%
2184 Incinerator	Suspected material in exterior wall.	No samples taken	
2180 Venturiaria	Suspected material throughout, suspected material in exterior wall, none friable.	Boiler room pipe insulation	10 to 20% asbestos

TABLE 3-9 (cont'd)

Building	Results of Initial Inspection	Type of Material Sampled	Results of Analysis
2179 Class 6 Storage, Social Actions, and Area Defense Council	Suspected material in Education Office, suspected material in exterior wall.	Boiler room pipe and tank insulation, ceiling tile, and water pipe insulation	1 sample contained asbestos at 80%, 3 samples did not contain asbestos.
2171 Communications Squadron	Suspected material in exterior wall.	Wall tile	1 sample did not contain asbestos.
2172 Communications Squadron	Suspected material throughout, suspected material in exterior wall.	No samples taken	NA
2131 Military Working Dog Kennels	No entry in registry	Ceiling tile	1 samples did not contain asbestos.
5700 Hospital	No entry in registry	Ceiling tile	2 samples did not contain asbestos.
2417 Administrative Facility	Suspected material throughout, suspected material in exterior wall.	Not identified	8 samples did not contain asbestos.
1086 Entire Building including Survival Equipment Shop	No suspected material noted in attic.	Roof, pipe, and tank insulation; spray-on treatment on walls and ceilings; ceiling tiles; panels; walls; and dust.	35 samples did not contain asbestos, 27 samples contained asbestos ranging from less than 1% to 100%.
2418 Physical Fitness Center	No suspected material noted throughout.	Heat pipe insulation and boiler room insulation (pipe insulation has since been removed).	2 samples contained asbestos ranging from 15 to 65%.
2471 Furniture Storage and Communication Facility	Suspected material in exterior wall.	Fire box, boiler, exhaust stack, water return pipe, and wall insulation.	3 samples contained asbestos ranging from 1 to 50%, 6 samples did not contain asbestos.
3306 Child Development Center	No suspected material noted.	No samples taken	NA

NA = Not applicable.

TABLE 3-10

Estimated Population of Communities Surrounding Beale AFB

	<u>Population</u>
Yuba County	57,300
Marysville	11,850
Wheatland	1,890
Unincorporated Area	43,600
 Sutter County	 62,500
Yuba City	24,600
Live Oak	4,100
Unincorporated Areas	33,800
 Total Yuba and Sutter Counties	 120,000
 Total Urban	 42,500

Source: Cal DOF 1989.

Note: Individual figures may not add to totals
because they have been rounded.

3.12.2 Economic Characteristics

Beale AFB lies in the Yuba City Metropolitan Statistical Area (MSA), which is composed of Yuba and Sutter Counties. The resident civilian labor force for Yuba City MSA was 44,700 in 1987, of which 39,450 people were employed, while 5,250 (11.7 percent) were unemployed (Cal EDD, 1988). The average number of jobs provided by Yuba City MSA-based employers totaled 34,500 in 1987, indicating that several thousand working residents of the region were employed away from the MSA. The structure of employment in the Yuba City MSA reflects a diversified economy resting on a strong base of agriculture, manufacturing, commerce, and government. Table 3-11 provides the composition of wage and salary employment for the Yuba City MSA in 1987.

The number of construction workers in the Yuba City MSA generally balances the demand for such skills, according to the California Employment Development Department (Cal EDD). During 1987, the number ranged between a wintertime low of 1,575 and a summertime high of 1,925 (Cal EDD, 1989). Construction workers in the area have remained a relatively constant percentage of the total labor force through the years, expanding with the overall growth of the area workforce (Cal EDD, 1988). The Sacramento Valley is an enormous labor market, and there is considerable mobility of workers responding to project opportunities throughout the region. The rapid growth of the valley and foothills communities has attracted large numbers of skilled and unskilled workers; therefore, no problem has been experienced in securing labor for construction projects.

The Cal EDD projects modest growth of employment in the Yuba City MSA. Between 1987 and 1989, Cal EDD estimated that the total number of jobs in the region would increase by about 850, or about 2.5 percent. The retail trade sector was expected to experience the largest employment increase of any sector during this period followed by the services and government sectors (Cal EDD, 1988). These projections do not take into account possible USAF actions. Other central foothill counties and counties around Sacramento are all projected to grow more rapidly than Yuba and Sutter in the near future (CCSCE, 1988), implying greater employment opportunities. Similar projections hold for the growth of personal income in the area. Personal income levels in the Yuba City MSA have been lower, on a per capita basis than the statewide averages. In 1987, the per capita income for the MSA was \$12,158, compared to the statewide average of \$17,841. The statewide average breaks down into a metropolitan portion average of \$18,044 per capita, and a nonmetropolitan area average of \$13,299 per capita. On this latter basis, the Yuba City MSA's per capita income is close to the statewide nonmetropolitan area average (BEA, 1989).

The Beale AFB Annual Report FY 1988 Economic Resource Impact Statement (ERIS) indicates that the base had a total of 4,642 personnel directly connected with host and tenant activities in FY 1988, of whom 4,142 were military personnel and 500 were civilians. An additional 748 civilian and contractor personnel were employed in the Base Exchange, private on-base business, and contractor assignments (Beale AFB 9th SRW/ACC, 1988). The ERIS estimates for payroll and expenditures spent in a 50-mile radius Economic Impact Region (EIR) are presented in Table 3-12.

TABLE 3-11

Annual Average Civilian Wage and Salary Employment
Yuba City Metropolitan Statistical Area, 1987
(Yuba and Sutter Counties, CA)

<u>Economic Sector</u>	<u>Number of Jobs</u>
Total agriculture, forestry, and fishing	5,200
Agriculture production	4,725
Agricultural services, forestry, and fishing	475
Total nonagricultural	29,300
Construction and mining	1,850
Manufacturing	3,200
Food & kindred products	1,100
Lumber & wood products	1,225
Other manufacturing	875
Transportation and public utilities	1,275
Wholesale trade	1,325
Retail trade	6,300
Finance, insurance, and real estate	1,425
Services	5,925
Government	8,025
Federal	1,475
State	850
Local & education	5,700
Total employment	34,500

Source: Cal EDD, 1988.

Note: Employment is reported by place of work. Individual job figures may not add to totals because they have been rounded.

TABLE 3-12
Payroll and Expenditures and Estimated
Impacts in 50-Mile Economic Impact Region in 1988

	Total Expenditures (\$ Millions)	Regional Impacts (\$ Millions)
Total Payrolls	\$101.11	\$58.59
Military (Appropriated)	80.07	44.35
Civilian (Appropriated)	12.32	7.15
Nonappropriated NAF and other civilian payroll	8.72	7.09
Total Construction and Services Procurements	\$54.57	\$44.38
Construction	25.13	5.60
Labor	(NA)	15.08
Materials and Equipment	(NA)	
Services	11.18	
Labor	(NA)	3.40
Materials and Equipment	(NA)	2.05
Education Funds (includes impact)	2.42	2.42
Commissary/Base Exchange	1.05	1.05
Other	14.79	14.79
Total Expenditures	\$155.68	\$102.97
Total Expenditures in EIR		\$258.65
Cumulative Impact of Spending in EIR		1,732
Secondary Job Creation Due to Expenditures		

NA = Not available.

Source: Beale AFB 9th SRW/ACC, 1988.

Note: Details may not add to totals due to rounding.

As indicated in Table 3-11, the \$102.97 million of direct Beale AFB-related spending within the 50-mile radius EIR for payroll, goods, and services generated a cumulative economic impact of \$258.65 million in 1988 (Beale AFB 9th SRW/ACC, 1988). This implies that the base had a regional multiplier effect equivalent to 2.5 times the value of direct base-related spending (a direct impact of \$102.97 million plus an indirect and induced effect of \$155.68 million). The economic impact region encompasses all of Yuba and Sutter Counties and portions of Butte, Sierra, Nevada, Placer, El Dorado, Sacramento, Yolo, and Colusa Counties. Secondary job creation due to the infusion of new income generated an additional 1,732 jobs in the region, according to the ERIS. Secondary job creation is the additional employment created within the 50-mile EIR in response to the multiplier effect of the base-related demand for construction, materials and equipment, and consumer goods. The level of demand is estimated in the ERIS based on levels of on-base construction activities, materials and equipment requirements, and payroll expenditures.

3.12.3 Housing

The housing situation in Yuba and Sutter Counties is relatively soft, with new single family home starts having declined between 1987 and 1988. According to the Yuba-Sutter Chamber of Commerce, the housing market is in equilibrium with the present supply of new homes equal to about 12 to 18 months of demand, at current levels. Rental vacancy rates in apartment complexes are running at 5 percent. (Yuba-Sutter CoC, 1989). New subdivision homes are being priced from \$75,000 to \$125,000. Developers and landlords are expecting that the closure of Mather AFB in Sacramento and transfer of some units to Beale AFB will firm up the market, and some spillover of housing demand from the Sacramento area is beginning to be experienced. According to the Base Housing Assistance Office, "the rentals in the Yuba City, Marysville area are generally within the price range of all the military assigned to Beale AFB." The average two bedroom apartment rents for \$300-450 per month, and a three bedroom house rents for \$495 and higher (Beale AFB 814th CSG/DEEV, November/December 1988).

Total housing in Yuba and Sutter Counties in 1987 amounted to 43,586 units, of which 28,478 (65 percent) were single family units, 9,920 were multiple family units (23 percent), and 5,188 (12 percent) were mobile home units (Yuba-Sutter CoC, 1989). The SACOG is projecting that by the year 2000, the housing stock in the two-county area will total 54,357 units, a 25 percent increase. This rate of growth is equivalent to an average annual compound rate of 1.71 percent, which is about the same as the recent trend of population growth in the area.

According to the Base Housing Assistance Office, military family housing at Beale AFB consists of 1,712 units (211 for officers and 1,501 for enlisted personnel), and typically there are about 200 families on the waiting list at any given time (Beale AFB 814th CSG/DEEV, November/December 1988). An estimated 606 Beale AFB families are housed in private housing off base. In addition to family housing, nine dormitories provide space for 1,090 Airman and Non-Commissioned Officers (NCO) not accompanied by dependents. Temporary lodging arrangements at Beale AFB consist of the following:

Visiting Airman Quarters	33 units	67 beds
Visiting Officer Quarters	37 units	37 beds
Temporary Lodging Facilities	24 units	66 beds

3.12.4 Education

Yuba and Sutter Counties have 41 elementary schools, five intermediate schools, ten high schools, 13 parochial/Christian schools, two special schools serving only handicapped students, one regional occupational program, 23 preschools and daycare centers, one community college, and three satellite colleges. Enrollment in the public elementary, intermediate, and high schools totaled 21,125 pupils in 1988--1,040 in the parochial/Christian schools, 335 in the special education schools, and 10,193 in Yuba Community College (Yuba-Sutter CoC, 1988).

Schools that educate dependents of Federally employed personnel are eligible for Federal Impact Aid Subsidies under Categories A and B. Category A funds apply to dependents who have a parent or parents who both live and work on base. Category B funds apply to dependents who have a parent or parents who work on base but live off base in housing that is not Federally subsidized. In FY 1987-88, Beale AFB education impact funds totaled \$2,123,101, with an additional \$301,000 being provided as tuition assistance for college-level student dependents (this money is included in the Construction and Services Procurement component of Table 3-11; ERIS, 1989). Most of the school impact assistance went to Yuba County schools. Federal funding of all types to Yuba County schools amounted to \$5.75 million in FY 1987-88 (Davis, 1990), which represented about 12 percent of the system's total budget of \$48.3 million. The Beale AFB school impact funds therefore accounted for more than one-third of the county schools' Federal funds, and for about 4 percent of the schools' total funding.

Table 3-13 shows the distribution of Beale AFB students in Yuba and Sutter Counties public schools, grades kindergarden through 12. Lone Tree (K-3) and Far West (4-6) schools are located on Beale AFB on sites leased by the Wheatland Elementary School District, but they operate independently of the base. All other schools are off base. Smaller school districts, such as Camptonville and Plumas Elementary in Yuba County and Live Oak Unified School District in Sutter County, had no students qualifying for impact assistance from Beale AFB (Personal communications, school districts, 1990).

The three satellite colleges are all housed at Beale AFB--Golden Gate University (of San Francisco), Chapman College, and University of Southern California. (Yuba-Sutter CoC, 1988). Education enrollment of base personnel totaled 2,191 persons during FY 1987-88: 27 in technical courses, 1,929 in undergraduate courses, and 236 in graduate courses. (ERIS, 1988)

3.12.5 Community Service Facilities

On Beale AFB, the 9th Strategic Hospital serves on-base requirements. It has a staff of 398 persons, of whom 362 are military and 36 are civilian employees

TABLE 3-13
Beale AFB Students Enrolled in Yuba and Sutter County
Public Schools, FY 1989-90, by Assistance Category, and School Capacity

School District	Number of Beale AFB Students by Assistance Category		Total Enrollment	Percent Beale AFB Students of Total Enrollment	Total Capacity	Total Enrollment as Percent of Capacity
	A	B				
Wheatland Elementary School District	1,109	100	1,209	76	2,533	63
Wheatland Union High School District	242	95	337	72	1,200	39
Marysville Joint Unified School District	0	255	255	3	9,800 ²	90
Yuba City Unified School District	0	202	202	2	9,130	25
TOTAL	1,351	652	19,572 ¹	10	22,663	86

Notes: ¹Approximately 3,000 additional students attended schools in districts with no Beale AFB associated students.

²Inferred from stated level of enrollment as a percent of capacity.

Source: Personal communications with school district administrative assistants.

(ERIS, 1988). Law enforcement is provided on base by the Security Police (9th Security Police Squadron), which has a total of 233 personnel (ERIS, 1988).

The Services Squadron (SV) of Beale AFB has the responsibility to provide for the needs of base personnel (EDAW, 1988). Under this charter, SV operates four functions: furnishings (such as linens, etc.); services (including the Base Exchange, which is managed by AAFES; the Base Commissary, which is managed by Air Force Commissary Services; the mortuary; and the honor guard); billeting; and dining. The Commissary provides troop issue support and subsistence support to authorized patrons--base personnel, dependents, and retired military personnel. The Base Exchange sells consumer goods at a main store, and provides other services at a number of small shops, a laundromat, a snackbar, a barbershop, and service stations. These are located in the cantonment area of the base, which also includes a post office, a credit union, a bank, and a number of recreational and activity facilities (EDAW, 1988).

The base's MWR organization (9 CSG/SS) provides a wide range of recreational and personnel support programs, including athletic programs, bowling and golf facilities, the Recreation Center, arts and crafts, a youth activities program, chaplain services, a veterinarian, and a childcare center. MWR also operated the Officers and NCO Open Messes, the Aero Club, and the base Rod and Gun Club (ERIS, 1988).

4.0 ENVIRONMENTAL CONSEQUENCES

This section provides a discussion of the environmental impacts associated with the realignment of the 323rd FTW to Beale AFB; means to mitigate adverse environmental impacts; potential cumulative impacts; any adverse environmental effects that cannot be avoided; the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitments of resources associated with implementation of the realignment. The concept of "significance" used in this document is defined in Section 1508.27 of the CEQ's regulations implementing NEPA, and includes consideration for both context and intensity (or severity). In the discussions that follow, criteria used to distinguish between significant and insignificant impacts are provided. To the extent feasible, distinctions are also made between local and regional significance, and short- versus long-term duration.

4.1 MISSION AND OPERATION

Implementation of the realignment would add a mission to Beale AFB and increase its overall operation. The realignment would increase personnel by approximately 1,602 (combined military, civilian, and student) and station 14 T-43 and 22 T-37 aircraft at Beale AFB. The realignment would require that additional facilities be constructed and/or modified in the flightline, cantonment, and family housing areas on base. These facilities would be associated with a new academic complex, aircraft maintenance complex, and base operating support facilities.

Aircraft operations at Beale AFB will be significantly increased as a result of the realignment. At Mather AFB, current SUNT flight activity consists of an average of 49 T-43 operations and 183 T-37 operations per day. When these operations are added to current Beale AFB flight activity, a maximum increase of approximately 34 percent--from 668 operations to approximately 897 operations per day--may result. An operation consists of one takeoff, one landing, one low approach, or one touch and go. In addition, the base population would increase by approximately 3,435 persons, including military personnel and dependents.

Increases in base personnel and overall base operation will help offset the recent force structure drawdown of the SR-71 program, which will be completed by June 1990. This drawdown resulted in the loss of approximately 624 positions (both military and civilian) on base, as well as a number of flight operations per day. The exact number of daily operations associated with the SR-71 drawdown is classified.

4.2 GEOLOGY, TOPOGRAPHY

General geologic conditions are considered to be similar across the base. Because of this similarity, potential impacts and mitigation measures are also expected to be similar, if not identical. For this reason, impacts and mitigation measures are discussed together as a whole and are applicable to all areas of the base.

Earthquake-induced strong groundmotion. Beale AFB is situated in a tectonically active region that can be expected to experience groundmotion within the foreseeable future. Strong groundmotion from earthquakes can damage structures or facilities not specifically designed and constructed to withstand such motion. Impacts associated with earthquake-induced strong groundmotion can be significant and adverse, but mitigable. However, based on the seismic history of the area and the fact that the nearest active fault is located approximately 25 miles from the base, impacts at Beale AFB are expected to be minimal.

Liquefaction, Settlement, and Expansive Soils. Liquefaction can occur in saturated granular soils subjected to strong groundmotion and will cause loss of soil strength so that structures will not be supported. The potential for liquefaction to occur in areas where realignment activities will occur is expected to be low due to the absence of significant saturated soils and because soils beneath the sites contain sufficient clay materials to preclude susceptibility to liquefaction. Differential settlement or expansion of soils underlying buildings, roads, and other facilities associated with the realignment may lead to damage of these structures. Damage typically consists of cracks in slabs or plaster, but may lead to significant structural damage if the settlement/expansion is extreme. However, because site-specific geotechnical investigations have not been conducted, the potential for liquefaction, settlement, or expansion cannot be dismissed. Impacts to the project from liquefaction could be significant and adverse, but are mitigable.

Erosion. There is a potential for erosion and subsequent deposition from sheetflow during heavy rains, as well as wind erosion. Impacts associated with excessive soil erosion and/or subsequent deposition of eroded material may involve damage to structures. These impacts could be significant and adverse, but are mitigable.

Construction-Related Impacts. Construction-related impacts to the geologic environment primarily involve terrain modification associated with grading (cuts, fills, berms, drainage diversion measures), dust generation, and increased erosion potential. These impacts could be significant and adverse, but are mitigable.

4.2.1 Cumulative Impacts

Because of the localized extent of the risk from seismic hazards and the nature of the potential impacts to and/or from the geologic environment, there should be no significant cumulative geologic impacts as a result of activities associated with the SUNT relocation to Beale AFB.

4.2.2 Mitigation Measures

The following measures are proposed to mitigate impacts to earth resources:

- Sheetflow runoff will be dissipated and directed to natural drainages, and disturbed areas will be revegetated as soon as feasible to reduce potential erosion impacts to insignificant levels.

- Grading activities will be limited to essential project areas only, and cut and fill volumes will be balanced to the extent possible to reduce construction-related impacts to insignificant levels.

The following potential measures would mitigate impacts to earth resources:

- All structures and facilities would be designed and constructed in accordance with applicable codes and standards to reduce potential strong ground-shaking impacts to insignificant levels.
- Site-specific geotechnical investigations would be required to evaluate whether subsurface soils are susceptible to liquefaction, settlement, and/or expansion. Specific recommendations developed by a qualified geotechnical engineer, based on the results of the geotechnical investigation, would be incorporated into building and facility designs to reduce these impacts to insignificant levels.

4.3 AIR QUALITY

Air quality impacts will be associated with both construction and operation phases of the realignment. The construction phase will use mobile diesel and gasoline construction equipment. The operation phase will result in incremental traffic emissions, and increased combustion emissions associated with SUNT-related aircraft.

Construction Activity Emissions. It is anticipated that total project construction activities will be spread over a period of 3 years. During this time, internal-combustion engines used to power construction equipment will be primary sources of NO_x, SO₂, CO, and reactive hydrocarbons (ROC, ozone precursors).

Construction air emissions have been estimated for individual construction activities on a daily and total cumulative basis. These emissions are based on an assumption of the types, size, quantity, and duration of use of construction equipment for construction projects of similar scope and magnitude. Maximum daily and total project construction emissions are provided in Tables 4-1 and 4-2. These tables present individual construction activities and approximate duration of these activities. There are three activities common to all phases: grading, foundation construction, and building erection. The construction phase also includes two additional activities: demolition, which will precede grading; and paving.

Grading activities will be the major contributor of air emissions associated with construction of SUNT facilities. Grading will require the use of heavy-duty equipment such as scrapers, motor graders, and dozers for earth movement. These grading activities will produce the peak daily air emissions for all criteria pollutants, except CO. Paving activities produce the peak daily emissions of CO due to the use of gasoline-powered dump trucks. High air emission rates of PM₁₀ during grading will result principally from fugitive dust due to ground disturbance by construction equipment. The amount of area disturbed has been conservatively estimated assuming one third of the total project area is disturbed at any one time. Building erection will contribute to total construction emissions due to the extended nature of this activity. Fugitive dust

TABLE 4-1
Maximum Daily Construction Emissions

Activity	Activity Duration (Weeks)	Emissions in lb/day ^a (tons/day)				
		ROC	NO _x	SO ₂	CO	PM ₁₀
1. Demolition	1	5.8 (*)	38.2 (.02)	3.5 (*)	82.4 (.04)	3.2 (*)
2. Grading Fugitive Dust ^b	13	116.0 (.06)	1,375.3 (.69)	135.8 (.07)	474.1 (.24)	118.10 ^c 2,906.70 ^c (1.45)
3. Foundation Construction	12	39.2 (.02)	191.9 (.10)	14.6 (.01)	861.2 (.43)	14.2 (.01)
4. Road/Street Construction	8	26.9 (.01)	45.6 (.02)	3.2 (*)	807.6 (.40)	3.1 (*)
5. Building Erection	67	23.7 (.01)	212.10 (.11)	15.9 (.01)	280.8 (.14)	15.9 (*)
6. Paving	5	26.9 (.01)	45.6 (.02)	3.2 (*)	807.6 (.40)	3.1 (.01)

Source: Dames & Moore computation.

^aAssumes 8 hours per day.

^bFugitive dust emissions occur during the grading activity.

^cFugitive dust emissions assume a 50% control efficiency for dust suppression (watering).

*Less than 0.01 tons/day.

TABLE 4-2
Total Construction Emissions

Activity	Activity Duration (Weeks)	Emissions (tons)				
		ROC	NO _x	SO ₂	CO	PM ₁₀
1. Demolition	1	0.01	0.10	0.01	0.21	0.1
2. Grading Fugitive Dust ^a	13	1.29	15.23	1.51	5.24	1.32 32.44 ^b
3. Foundation Construction	12	0.32	1.81	0.14	6.59	0.14
4. Road/Street Construction	8	0.54	0.91	0.06	16.15	0.06
5. Building Erection	67	1.32	11.85	0.89	15.67	0.89
6. Paving	5	<u>0.34</u>	<u>0.57</u>	<u>0.04</u>	<u>10.10</u>	<u>0.04</u>
TOTAL PROJECT:		3.82	30.47	2.65	53.96	34.99

Source: Dames & Moore computation.

^aFugitive dust emissions occur during the grading activity.

^bFugitive dust emissions assume a 50% control efficiency for dust suppression (watering).

emissions due to ground disturbance are expected to be minimal during non-grading activities.

Construction Activity Impacts. Impacts from construction emissions could exacerbate existing air quality, but impacts would be short-term, localized, and mitigable. Short-term exceedance of the NAAQS and CAAQS for PM_{10} could result from fugitive dust emissions associated with grading. PM_{10} impacts could be significant and adverse during grading operations if concurrent with high wind conditions, but mitigable.

Combustion emissions of NO_x and ozone precursor hydrocarbons from diesel-fired mobile construction equipment could contribute to an exceedance of the 1-hour NAAQS and CAAQS for ozone in the region. Grading equipment, because of their higher peak daily emissions, would have more effect on ozone than other construction activities. However, the impact of the emissions of NO_x and ozone precursors during grading will be significant only in the project area and will not significantly affect regional (air basin) air quality. Agriculture (pesticides, biomass, etc.) and transportation sources in the Sacramento metropolitan area are the major contributors to the ozone levels in Yuba County. The construction emissions (especially with staggered grading activities) would represent an incremental, short-term increase in the emissions inventory for the county. The probability of short-term localized exceedances of the NO_x , CAAQS and NAAQS will be minimal because: 1) construction equipment is mobile, 2) engine loads will fluctuate, and 3) the region is in attainment with respect to NO_x .

The construction related-air emissions of SO_2 and CO are expected to have insignificant impacts to local and/or regional air quality. Air quality impacts from CO emissions are usually associated with urban traffic, while SO_2 emissions are associated with large industrial point sources. Neither of these types of sources exists at or in the vicinity of Beale AFB.

Operational Emissions. Operational emissions of hydrocarbons, NO_x , SO_2 , CO, and PM_{10} will result from direct (primary) and indirect (secondary) activities associated with the realignment. Primary project emissions will emanate from the following direct activities and sources:

- Aircraft combustion emissions (idling and takeoff and landing cycles).
- Aircraft refueling emissions.
- Aircraft maintenance, including engine overhaul and testing.
- Parasail-related motor vehicle activity.

Secondary project emissions include the following indirect activities and sources:

- Transportation emissions (automobile traffic and bulk delivery trucks).
- Building maintenance.
- Fugitive hydrocarbons from the Shop and Gas convenience store.

The majority of direct project emissions will be associated with the operation of the SUNT training aircraft. Combustion emissions associated with the jet engines

have been calculated on a daily and annual basis. The aircraft will produce air emissions while in idle, takeoff, climbout, and approach modes. Emissions during cruising generally do not affect ambient air quality because they are released above the inversion layer. Table 4-3 presents the daily and annual emissions for SUNT training aircraft. Existing annual aircraft emissions from all flights, except those from the SR-71 and U2, are also presented in Table 4-3 for comparison to SUNT activity flight emissions. The comparison shows the largest percentage emissions increase will be for NO_x , approximately 26 percent. These projected emissions have been calculated based on typical modal times for USAF training operations and emission characteristics of AT-39 engines (EPA, 1985). Emissions associated with engine maintenance and aircraft refueling activities will contribute to total project hydrocarbon emissions; however, these are not included in this analysis.

Secondary emissions for SUNT operations associated with commuter traffic have been quantified based on the estimated number of commuter trips. The Shop and Gas facility will also have fugitive hydrocarbon emissions from fueling additional personal vehicles. Tables 4-4 and 4-5 present these emissions on a daily and annual basis assuming approximately 276 round-trips (rt) per day from each of the off-base communities of Wheatland (50 miles rt), Yuba City (32 miles rt), and Marysville (26 miles rt). These trips assume minimal carpooling and typical emission profiles for California vehicles. Air emissions from residential housing will be primarily due to space and water heating by natural gas combustion.

Operation Impacts. Because a complete air emissions inventory is not available for Beale AFB, total operational impacts (aircraft and ground equipment) associated with the SUNT operations cannot be quantified. However, it is anticipated that air quality impacts resulting from the realignment will be insignificant with respect to regional conditions. SUNT operations presently occur at Mather AFB, which is 40 miles south of Beale AFB. Both bases are located within the Sacramento Valley air basin. Therefore, the SUNT operations at Beale AFB will not introduce a new source of emission into the basin or impact regional ozone levels. Emissions will impact local air quality on and near the base.

SUNT ground operations that include degreasing, painting, solvent use, and engine testing will require air quality permits from Yuba County. These permits will require the use of BACT in accordance with the California Clean Air Act for control of hydrocarbon emissions.

4.3.1 Cumulative Impacts

The SUNT operation emissions may represent a replacement of SR-71 related air emissions to the Beale AFB air emission inventory; although, due to classification of the data on SR-71 related operations and emissions, these were not included in the analysis. The number of days when the NAAQS and CAAQS for ozone is exceeded in Yuba County is not expected to increase.

The emissions from aircraft operations emanate as mobile sources that are dispersed rapidly and have minimal localized air quality impacts. Emissions of NO_2 , SO_2 , CO, and PM_{10} are not expected to exceed the NAAQS and CAAQS. The

TABLE 4-3

**Daily and Annual Aircraft Emissions
From SUNT Operations**

Mode	Emissions (lb/day)				
	ROC	NO _x	SO ₂	CO	PM
Idle	196.6	28.6	9.2	635.9	2.5
Takeoff	0.8	119.8	4.3	3.0	6.4
Climbout	1.0	168.7	6.0	4.2	8.4
Approach	<u>3.0</u>	<u>482.1</u>	<u>17.1</u>	<u>12.0</u>	<u>24.0</u>
Daily Totals:	201.4	799.2	36.6	655.1	41.3
	Emissions (tons/year)				
	ROC	NO _x	SO ₂	CO	PM
Idle	25.55	3.71	1.20	82.66	0.33
Takeoff	0.10	15.58	0.56	0.39	0.83
Climbout	0.14	21.94	0.78	0.55	1.09
Approach	<u>0.39</u>	<u>62.67</u>	<u>2.22</u>	<u>1.56</u>	<u>3.12</u>
Annual Totals:	26.18	103.90	4.76	85.16	5.37
Annual Existing Beale AFB Aircraft Emission	839.00	399.00	64.00	2,116.00	22.00
SUNT increase as percent of existing Beale AFB aircraft emissions	3	26	8	.04	25

Source: Dames & Moore computation.

TABLE 4-4
Daily Secondary Emissions from SUNT Operations

Activity	Emissions in lb/day (tons/day)				
	ROC	NO _x	SO ₂	CO	PM
Automobile Traffic					
Off-base commuting	52.03 <u>4.26</u>	(.03) (*) 86.02 <u>4.38</u>	(.04) (*) 8.74 <u>0.30</u>	(.28) (.02) 568.87 <u>49.00</u>	(.01) (*) 21.74 <u>0.73</u>
On-base commuting					
Subtotal	56.29	(.03)	(.05)	617.87	(.01)
SR-71 Drawdown Shop and Gas	(25.27) <u>5.13</u>	(.01) (*) (41.78) <u>--</u>	(.02) (*) (4.27) <u>--</u>	(.14) (.14) (276.30) <u>--</u>	(.01) (.01) (10.56) <u>--</u>
Total	36.15 (.02)	48.62 (.02)	4.77 (*)	341.57 (.17)	11.91 (.01)

Source: Dames & Moore computation.
*Less than 0.01 tons/day.

TABLE 4-5
Annual Secondary Emissions from SUNT Operations

Activity	Pollutant (ton/yr)				
	ROC	NO _x	SO ₂	CO	PM
Automobile Traffic					
Off-base commuting	6.77	11.18	1.14	73.95	2.83
On-base commuting	<u>0.55</u>	<u>0.57</u>	<u>0.04</u>	<u>6.34</u>	<u>0.10</u>
Subtotal	7.32	11.75	1.18	80.29	2.93
SR-71 Drawdown Shop and Gas	(3.28) <u>1.06</u>	(5.43) <u>--</u>	(0.55) <u>--</u>	(35.92) <u>--</u>	(1.38) <u>--</u>
Total	5.10	6.32	0.63	44.37	1.55

Source: Dames & Moore computation.

cumulative air quality impacts of SUNT aircraft with other base facilities will be negligible due to the intermittent use and extreme mobility of aircraft. The relocation of the SUNT operations will result in an increase in the Beale AFB air emissions inventory, however, the large spatial spread of Beale AFB emission sources and its relative isolation from other major sources of emissions in Yuba County will result in an insignificant cumulative effect on air quality.

It is assumed that emissions from SUNT operations at Beale AFB will be similar to those currently occurring at Mather AFB. Since both are in the same regional air basin, no significant cumulative impact on regional air quality is anticipated other than those emissions associated with construction related activities.

4.3.2 Mitigation Measures

Construction-related Mitigations. The following proposed mitigation measure will help to reduce construction-related air quality impacts to insignificant levels:

- During high wind conditions, watering of disturbed areas and/or application of chemical dust suppressants will be implemented to help control fugitive dust.

The following potential measures would further reduce construction-related air quality impacts:

- Construction activity would be planned to minimize overlap of activities and subsequent overlaps in peak short-term emissions.
- Vapor recovery systems would be installed on any gasoline-powered construction equipment.
- During periods of high ozone conditions, construction activity would be temporarily curtailed to minimize the potential for an ozone NAAQS and/or CAAQS violation.
- Paving of high-use haul routes and covering of stock piles would be performed to help minimize fugitive dust.

Operation-related Mitigations. The following potential mitigation measures incorporated in SUNT operations would help to reduce operational air quality impacts to insignificant levels:

- Development of an on-base and off-base transportation plan to encourage car/van pooling and bus transportation.
- State-of-the-art natural gas boilers would be used at new facilities to the extent feasible.

4.4 WATER RESOURCES

Potential impacts to water resources will be similar at all areas where realignment activities will be located. Because of this similarity, potential impacts and mitigation measures are discussed as a whole and are applicable to all areas.

Potential impacts associated with flooding could include damage to structures and the interruption of SUNT activities. However, the potential for flooding in areas where the realignment activities will occur is considered to be very low due to the following factors:

- Limited watershed areas that would in turn limit the potential supply of runoff onto these areas.
- The relatively flat or gently rolling terrain.
- Significant distance from the three principal drainages on Beale AFB to new realignment facilities.
- The relatively small, seasonal rainfall that characterizes the Beale AFB area.

Therefore, the impacts of flooding in areas where SUNT activities are proposed are not considered significant.

The increased water demand (Section 4.10) as a result of the realignment will be primarily a result of domestic uses and is not expected to significantly affect regional water table levels or alter the direction of groundwater flow. Despite relatively high water use in areas around Beale AFB for agricultural irrigation, the additional water demand as a result of SUNT activities is not expected to be significant with respect to the base's or to overall regional groundwater availability, and is not anticipated to affect other groundwater users in the area.

Existing surface water quality in Hutchinson Creek/Dry Creek, Best Slough, or other drainages will not be adversely affected by construction or operation-related activities associated with the realignment. This is due to the remoteness of these drainages from construction areas and the relatively flat or gently rolling intervening terrain.

4.4.1 Cumulative Impacts

Beale AFB is relatively isolated from other water users in the area. This, coupled with the fact that the additional groundwater supply necessary to support the SUNT realignment will not adversely affect regional groundwater conditions, suggests that cumulative impact to water resources will not be significant. This will be further reinforced when the SR-71 drawdown is complete and approximately 624 military and civilian positions are eliminated from Beale AFB.

4.4.2 Mitigation Measures

The following mitigation measures are proposed to reduce potential impacts on water resources to insignificant levels:

- Site grading activities will be minimized during the rainy months (November-March) to the extent feasible.
- All grading and site preparation plans will incorporate best available storm water management practices.

No other mitigation measures are proposed.

4.5 BIOLOGICAL RESOURCES

Construction of the 50-acre CAMS facility, as well as other flightline area structures, will not result in significant adverse impacts to sensitive biological resources. The proposed new gymnasium lot contains a small vernal pool and two small poplar trees. This loss is considered insignificant because of the small size of the vernal pool (only 40 square feet) and the small number of trees, and because of the previous disturbance in this area. Introduced annual grassland will be removed from many facility locations; however, this loss is considered minor in the context of the large amount of similar habitat throughout Beale AFB.

Construction of an access road north of the CAMS site would result in the removal of three or four vernal pools located along a small drainage. These pools are mostly small; the largest appears to be about 100 by 25 feet. Loss of these pools is not considered a significant impact because: (1) the pools are small and not likely to provide substantial habitat compared to other larger, more developed pools on the base; and (2) this portion of the base does not represent an important vernal pool area (Personal Communication, John Thomson, Beale AFB, November 1989). It should also be noted that neither the base-wide SCS wetland study or the National Wetland Inventory maps indicated the existence of these pools at the CAMS site, nor the pool at the proposed gymnasium site, due to their small size, shallow impoundments, and low numbers.

Development of most of the Academic Complex facilities will not result in the removal of any native habitat, nor any impacts to threatened or endangered plant or wildlife species. It is recommended that construction activities in the cantonment area be excluded from the cottonwood tree grove and wetland habitat adjacent to Hutchinson Creek.

An intermittent drainage with freshwater marsh vegetation and sparse riparian scrub is located near the preferred location for the Shop and Gas facility. Since it is adjacent to other structures and roadways, the drainage is not considered highly sensitive. As such, loss of this habitat is not considered significant.

The Parasail Area will require clearing and grading within a 3,000-foot-diameter circular road, improvement of an access road to the site, and installation of support facilities. The preferred parasail area near the southern base boundary will result in the removal of the annual grassland habitat, possible removal of vernal pools, and possible disturbance to an intermittent drainage course leading to Hutchinson Creek. The two alternative parasail areas south of Doolittle Drive and south of Warren Shingle Drive would primarily affect previously disturbed areas. They are likely to have less impact on biological resources than the preferred parasail area near the base boundary.

The USAF will coordinate all efforts associated with impacted wetland and vernal pool areas on base with the U.S. Army Corps of Engineers (COE). This would include identification and delineation of impacted wetland/vernal pool habitats in accordance with the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (FICWD, 1989). Based on the results of these delineations, appropriate permits will be applied for, and, if necessary, mitigation measures will be implemented in accordance with COE recommendations.

The construction of new facilities and conduct of SUNT operations will not impact any known threatened or endangered vegetative or wildlife species on Beale AFB. In addition, these activities will not adversely affect migratory deer populations on base, or anadromous fish populations in Dry Creek/Best Slough.

4.5.1 Cumulative Impacts

The realignment of Beale AFB will require the construction of a number of new facilities on the base. However, this action, in conjunction with the recently programmed force structure drawdown of the SR-71 program at Beale AFB, will not have significant cumulative impacts to biological resources.

4.5.2 Mitigation Measures

In addition to coordinating with the COE regarding possible wetland/vernal pool habitats, the following measures are proposed to mitigate potential impacts to biological resources to insignificant levels:

- Limit grading areas to the minimal amount feasible.
- Exclude construction activities near the cottonwood tree grove in the cantonment area.
- Avoid wetland/riparian habitat adjacent to Hutchinson Creek in the cantonment area, and protect this area with use of silt curtain/fence material until construction in this area is completed.
- Develop a landscape plan to re-establish vegetation in disturbed areas as quickly as is feasible. The plan should include the use of native species to the extent possible.

- Develop a vernal pool mitigation area on base to replace similar habitat loss.

4.6 ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL RESOURCES

No standing historic structures or sites of specific ethnographic or heritage concern have been identified on Beale AFB. Hence, the impact assessment focuses on potential effects to archaeological sites.

The realignment may cause both direct and indirect impacts to archaeological resources. Potential direct impacts would result primarily from ground disturbance associated with construction of the proposed facilities. These activities (use of heavy equipment, grading, excavation, and other disturbances), if conducted in the area of archaeological sites, may cause displacement, breakage, or removal of archaeological materials. Removal of archaeological materials would result in total data loss for the affected area, while displacement of materials would compromise the vertical and horizontal contexts that are crucial for archaeological interpretation. If artifacts or other remains are broken or crushed, diagnostic elements are often lost.

The addition of new personnel to the base would increase the potential for indirect impacts to archaeological resources. In general, these types of impacts consist of casual collecting of surface artifacts or displacement of archaeological materials resulting from increased use of base grounds. Casual collecting is of particular concern because formal artifacts, which are often particularly important for understanding site function, are usually most susceptible to this activity.

Construction activity associated with the realignment will primarily occur in areas that are either classified Zone D or Zone E as it relates to potential archaeological sensitivity on Beale AFB (see Appendix B for a detailed explanation of these zones). The Academic Complex proposed for the cantonment area is located entirely within the zone of lowest sensitivity for the base (Zone E). Although none of the proposed impact area has been surveyed, a roughly 30-acre parcel about 200 meters to the northwest has been surveyed with negative results (Johnson and Kenton, 1982). No archaeological sites or historic locations are known to exist within this portion of the cantonment area and significant impacts to these types of resources are unlikely.

The flightline area is within the Prime Vernal Pool Terrain sensitivity zone (Zone D). A roughly 1/2-mile corridor to the east of Doolittle Drive has recently been surveyed under a privately funded investigation, resulting in the discovery of three small bedrock mortar sites about 1 mile north of the potential impact area (Maniery, 1989). No surveys have been conducted within the proposed CAMS area and no archaeological sites have been recorded there. One historic location is shown on the 1911 Downs Valley USGS topographic quadrangle, surveyed in 1909. Doyles 1887 map identifies the landowner as M. Shaw. However, no surface manifestation of this structure currently exists in the area.

4.6.1 Cumulative Impacts

The SR-71 drawdown did not require construction or demolition of buildings or create other disturbances in areas of historical or archaeological sensitivity. Therefore, the realignment of Beale AFB is not expected to create significant cumulative impacts to archaeological, historic, or cultural resources known to occur on base.

4.6.2 Mitigation Measures

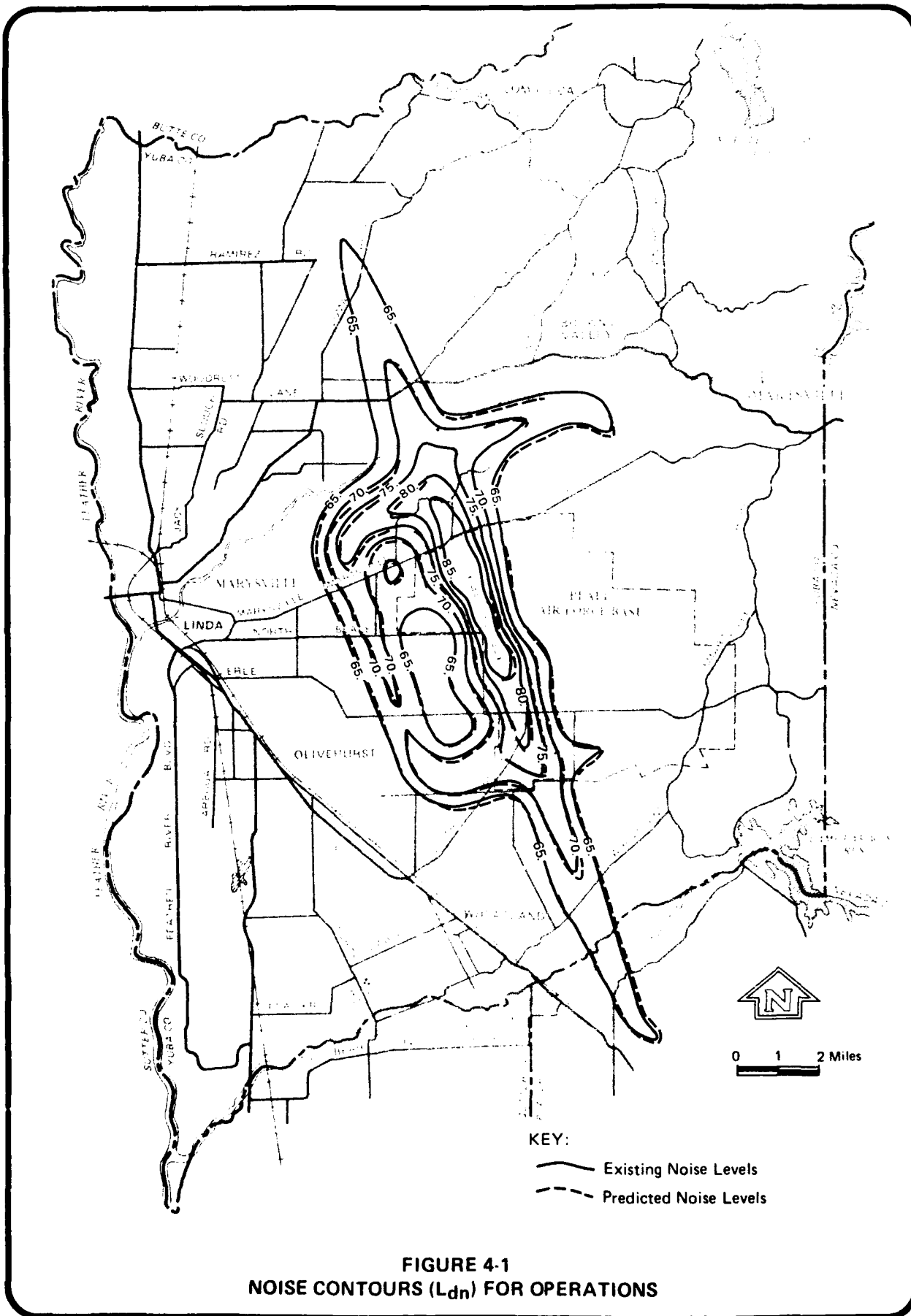
Mitigation of archaeological impacts associated with the realignment of Beale AFB will be accomplished in accordance with regulations implementing Section 106 of the National Historic Preservation Act. Consultation with the SHPO has been initiated regarding appropriate procedures to identify potentially significant cultural resources that could be affected by the project. Implementation of the following proposed mitigation measures will reduce potential impacts to archaeological resources to insignificant levels:

- Initiate and/or complete archaeological surveys of previously unsurveyed portions of the project areas.
- Conduct archaeological monitoring during construction to identify potential buried archaeological features and artifacts and take appropriate actions to protect such resources.
- Consult with SHPO regarding the significance of additional cultural resources that may be identified during the archaeological survey and develop and execute appropriate treatment programs for such resources.

4.7 NOISE

In order to assess noise impacts related to SUNT operations at Beale AFB, the Air Force Engineering Services Center at Tyndall AFB, Florida generated a series of noise contours that incorporated projected SUNT operations with current base flight operations using data produced for the AICUZ program. The noise contours were developed using the computer program NOISEMAP, which is documented and described in Appendix C.

Noise contours were generated for flying activities anticipated to occur with the SUNT operations. Figure 4-1 indicates a slight increase in noise levels, expressed in L_{50} , over existing conditions. Although noise levels of 65 L_{50} or greater cover a large area around Beale AFB, the addition of the SUNT operations will not significantly expand this area. The area under the contours, 65 L_{50} or greater, will be approximately 36,300 acres, compared to 35,550 acres for current conditions. This represents an increase of approximately 2 percent, which is considered insignificant. Land use around the base is primarily agriculture and mineral extraction, which are not noise-sensitive activities.



Aircraft flight operations associated with SUNT activities are at subsonic speeds. Therefore, no impacts from sonic booms will occur as a result of the realignment.

4.7.1 Cumulative Impacts

The deactivation of the SR-71 program at Beale AFB has resulted in a reduction in flight activity and a subsequent reduction in noise levels surrounding the base. Noise complaints have decreased considerably since the deactivation of the SR-71 program. The expected noise reduction as a result of drawdown of the SR-71 program is nearly equal to the predicted noise increase as a result of the realignment (HQ SAC, 1990). Therefore, the realignment of Beale AFB to accommodate the SUNT will have no significant cumulative effect on noise levels at Beale AFB.

4.7.2 Mitigation Measures

To further reduce potential noise impacts to insignificant levels, it has been proposed that the USAF minimize night flight activity associated with SUNT operations to the extent practical. No other mitigation measures are proposed.

4.8 LAND USES

No significant impacts are expected to occur to existing land uses outside Beale AFB as a result of the realignment. Increased flight activity, associated with SUNT operations, is predicted to expand the land area included under the 65 L_{dn} noise contour by 2 percent (from 35,550 acres to approximately 36,300 acres). This increase is not considered significant because current land uses in this area are primarily agriculture and mineral extraction. In addition, this small increase should still be consistent with the CLUP and Yuba County's General Plan.

4.8.1 Cumulative Impacts

No cumulative impacts to land uses are expected to occur as a result of the SUNT addition to Beale AFB.

4.8.2 Mitigation Measures

No mitigation measures are proposed.

4.9 TRANSPORTATION

The relocation of the SUNT to Beale AFB will increase personnel on the base by approximately 1,602 persons--829 permanent party and an average of 773 students. Living quarters adjacent to the Academic Complex is planned for the students. No decision has been reached regarding the possibility of additional on-base housing for permanent party personnel. Therefore, approximately 829 SUNT personnel can be expected to live off base and travel daily by car to SUNT facilities in the cantonment and flightline areas (as a worse-case scenario). These additional car trips will adversely affect the ability of the existing gates to accommodate traffic, especially during morning and evening peak periods. Information on expected changes in peak period round trips

is shown in Table 4-6. Additionally, dependents of SUNT personnel will travel to base by car through the various base gates to take advantage of on-base facilities. The relative impact on each gate will depend on destinations and time of day of travel. These impacts are expected to be adverse and significant, but mitigable.

Relocated SUNT personnel and their dependents will add auto traffic to the on-base road system. Detailed information on numbers of personnel expected at specific on-base destinations is not available to quantify impacts at individual roads and intersections. However, it is expected that a number of intersections currently at or exceeding their capacity would receive increases in traffic volume. This traffic increase represents an adverse and significant, but mitigable impact.

Parking on base will also be affected by the addition of SUNT personnel automobiles. Additional parking space for the expected 1,602 new personnel will be needed in the cantonment and flightline areas. It should be noted that parking convenient to many existing facilities in the flightline area is already limited. This represents an adverse and significant, but mitigable impact.

Rail and truck delivery of aviation fuel is also expected to increase as a result of the proposed action. Information on the level of increased delivery activity that will be required to support the SUNT relocation has not been quantified by base personnel. However, rail and truck deliveries to support SUNT operations are not anticipated to have a significant impact to existing base facilities.

4.9.1 Cumulative Impacts

The deactivation of the SR-71 program will eliminate approximately 624 positions, which will result in a small but beneficial impact to ground transportation. This beneficial impact will reduce the overall impacts on base transportation due to realignment.

4.9.2 Mitigation Measures

Improvements to transportation recommended in the Beale AFB Draft Comprehensive Plan (EDAW, 1988) would help to mitigate impacts to gates, on-base roads, and parking from the addition of SUNT personnel and their cars. These recommended improvements address capacity problems at several intersections on Doolittle Drive: standardization of control signing and marking; inadequate flightline parking; poor parking layout design; two poorly aligned and narrow bridges on Gavin Mandery Drive; and lack of appropriate pedestrian and bicycle routes. A brief summary of the potential improvements recommended in the Draft Base Comprehensive Plan follows.

- Improve a number of intersections on Doolittle Drive and implement measures to reduce traffic in the central cantonment area.
- Install school zone signing and beacons according to the Manual on Uniform Traffic Control Devices (MUTCD), as well as establish student walking routes and install crosswalks and crosswalk signs.

TABLE 4-6

Impact on Peak Period Round Trips

	<u>Existing Conditions</u>	<u>Additions with SUNT Relocation</u>	<u>Conditions After SUNT Relocations</u>
Personnel	4,134 ¹	829	4,963
Personnel Residing Off-Base	1,332	829	2,161
Approximate Number of Peak Period Round Trips (weekday)	1,079 ²	671 ²	1,750 ²

Notes: ¹Beale AFB 9th SRW, 1990

²Assuming an average occupancy of 1.235 persons per car as measured on various weekdays in December 1987. EDAW, 1988.

- Improve parking lots, including construction of new parking facilities on the flightline, and improve layout and access points for the major lots in the cantonment areas.
- Upgrade striping and signs to conform with the MUTCD to improve safety.
- Replace right-hand passing lanes on Gavin Mandery Drive and in front of the hospital on Warren Shingle Drive with left-turn lanes to improve safety.
- Install guide signs at appropriate locations with a level of information comprehensible in moving traffic.
- Improve the roadside at the intersection of A Street and Doolittle Drive so that driveways for the fueling area can be differentiated from A Street and thereby improve safety.
- Develop a comprehensive pathway system in the cantonment and flightline areas to improve pedestrian access.
- Develop a local road between A and B Streets as the primary access road to the Base Exchange and Commissary parking lots in conjunction with planned relocation of the Commissary.
- Develop a collector road as the primary access point to the flightline using sections of Douglas Street, Creasman Avenue, and Curtis Street to provide safe and efficient travel in that area.

In addition to improvements recommended in the Draft Comprehensive Plan, additional mitigation measures are proposed to help reduce the impact of SUNT traffic on Beale AFB gates, roads, and parking to insignificant levels.

To accommodate the peak hour arrivals and departures, Doolittle, Main, and Wheatland gates should be expanded. Additional lanes at Doolittle, Main, and Wheatland gates with the appropriate additional security personnel to adequately cover the lanes will allow the increased number of peak hour arrivals and departures to be processed without excessive traffic congestion.

A decrease in the number of single-occupant car trips should be encouraged to reduce traffic congestion and parking space requirements. A combination of ride-sharing, expanded on-base shuttle bus service, and pedestrian and bicycle travel will reduce on-base traffic generated by the SUNT relocation.

Additional parking spaces will be required even if a decrease in the proportion of single-occupant car trips is achieved. Up to 1,602 additional spaces could be required if all the SUNT personnel have cars on base at one time. Parking improvements already planned or recommended in the Draft Comprehensive Plan

and as part of the planned SUNT facilities should be implemented for the relocated SUNT personnel.

4.10 UTILITIES

Current electrical service and capacity is adequate to meet the additional demand anticipated by the addition of the SUNT to Beale AFB. Although increased electrical usage will occur as a result of the realignment, this impact is not considered to be significant.

The addition of the SUNT will increase the average daily number of water users by approximately 2,000 (assuming 400 dependents), or 20 percent. This will increase the average daily water usage to approximately 3.0 mgd in the winter and to 7.2 mgd in the summer. When the SR-71 program is completely deactivated (June 1990), these usage numbers will only increase by 10 percent to 2.75 mgd in the winter and 6.6 mgd in the summer as a result of the SUNT realignment. Although this is well below the 11.25 mgd capacity of the base water supply system, excessive pumping may increase high mineral levels in the water.

The water treatment plant has a capacity to treat up to 7.0 mgd; however, the only treatment is disinfection and chlorination. Additional treatment may be required to remove excess minerals due to excessive pumping (Personal Communication, Mr. Tony Guerraro, Manager Waste Treatment and Water Supply, Beale AFB, October 1989). The water distribution system appears to be adequate over the base with the exception of the failing 18-inch water supply line leading from the well field area to the main pump station.

A new BIDDS Communications System is currently planned for installation at Beale AFB, which is unrelated to the SUNT relocation. This system will be in place and operational before the commencement of SUNT operations. The new BIDDS system has the capacity to handle present and planned growth at Beale AFB (including the SUNT relocation) into the foreseeable future. Therefore, no significant or adverse communication impacts will occur.

4.10.1 Cumulative Impacts

The realignment of Beale AFB will not present any significant cumulative effects to the base electrical supply and communications systems. If the mitigation measures proposed below are implemented, there will be no significant cumulative impacts to existing water supply or usage. The unrelated but planned deactivation of the SR-71 program will not provide any adverse cumulative effects to utilities.

4.10.2 Mitigation Measures

A number of measures could mitigate impacts to base utilities to insignificant levels:

Electrical Supply and Communications. No mitigation measures are proposed.

Water Supply. To mitigate impacts to the water distribution system, the following is proposed:

- Replacement of the failing 18-inch water supply line from well field with a 20-inch line.

Potential mitigation measures include the following:

- Addition of a second 8-inch supply line to the flightline area to ensure adequate and sustained water for firefighting purposes.
- Addition of booster pumps to deliver water to the family housing area.
- Upgrading of system to add treatment for manganese.

4.11 WASTE MANAGEMENT

Solid Waste Disposal. The landfill has 2,950,000 cubic yards (cy) capacity remaining or approximately another 45 years of life at projected use rates. The addition of the SUNT to Beale AFB is expected to increase solid waste disposal by about 20 percent per month to about 6,300 cy per month. This will reduce the useful life span for this facility to about 39 years, and represents an adverse and significant, but mitigable impact to solid waste disposal.

Wastewater Disposal. The existing wastewater and sewage disposal system has adequate capacity to handle projected requirements generated by the realignment. However, the new kitchen in the flightline area will add flow volumes that exceed the lift pump capacities at the Building No. 1086 lift station. This is considered to be an adverse and significant, but mitigable impact.

All sanitary flow is delivered to the Beale AFB STP. The STP has a design capacity of 5 mgd and presently peaks at 1.45 mgd. The STP has sufficient capacity to handle the 20 percent increase in volume expected to be generated (approximately 1.75 mgd during peak periods) as a result of the SUNT relocation and is not expected to experience any significant or adverse impacts.

During periods of heavy rain, stormwater runoff infiltrates the sanitary sewer system and could cause an overflow condition if the operators did not meter the flow into the plant by allowing receiving lines to backfill. To date, this has not caused significant problems. However, with the addition of the SUNT personnel and the addition of increased hard surface areas that would allow for an overall increase in stormwater runoff, this condition is considered to be potentially adverse and significant, but mitigable.

Hazardous Waste Generation and Disposal. The addition of the SUNT to Beale AFB is not anticipated to generate significant quantities of hazardous waste. These wastes would be limited to fuels, lubricants, antifreeze, and other similar products associated with the operation and maintenance of the T-37 and T-43 aircraft. Any waste generated as a result of the operation of these aircraft would be stored and

disposed of in accordance with existing base policies and procedures for hazardous materials, as well as in accordance with appropriate State and Federal regulations. Therefore, no significant impacts relating to hazardous waste generation and disposal are anticipated.

Installation Restoration Program. Current IRP activities at Beale AFB directed at cleanup of past hazardous waste disposal sites will continue unimpeded throughout the construction period, as well as during the operation of SUNT activities. The new or modified facilities required to accommodate the SUNT will not affect any identified IRP site with the exception of Site 22, which encompasses a broad area of the base and addresses abandoned USTs. However, base-wide IRP remedial investigation/feasibility studies and subsequent remedial action will continue until cleanup is complete. Therefore, the realignment of Beale AFB to accommodate the SUNT will not adversely impact ongoing IRP activities.

Underground Storage Tanks. A UST survey of approximately 100 acres in the immediate vicinity of the preferred location for the Academic Complex has been completed. The survey indicated several potential UST locations. Other areas where facilities are being constructed have not been surveyed. It is very unlikely that USTs exist in the planned Parasail Area or in the area planned for the CAMS. However, it is anticipated that they will not present a significant impact to the overall development of facilities.

Asbestos. Asbestos may be present in some of the buildings identified for demolition or renovation; however, a detailed sampling program has not yet been conducted. The presence of asbestos is not likely to present significant impacts as long as appropriate remedial actions are implemented to safely remove asbestos prior to demolition or renovation activities.

4.11.1 Cumulative Impacts

No significant cumulative impacts to waste management are expected as a result of the SUNT relocation. Reductions in hazardous waste generation as a result of the deactivation of the SR-71 program will help to offset increases in solid and liquid waste generation expected as a result of the realignment.

4.11.2 Mitigation Measures

Mitigation measures could reduce potential impacts to waste management to insignificant levels.

Solid Waste Disposal

- A potential measure is to vigorously pursue a program to recycle wastes, especially paper, glass, and aluminum cans to help minimize landfill use and extend its expected life.

Wastewater Disposal

Two potential measures are:

- One hundred percent backup lift pumps at the Building No. 1086 lift station to meet additional capacity needs.
- Development of a stormwater management program with adequate pretreatment of possibly contaminated runoff. This will help minimize the practice of allowing lines to backfill and reduce the potential for overflow of the STP system.

Hazardous Waste Generation

No mitigation measures are proposed.

Installation Restoration Program

No mitigation measures are proposed.

Underground Storage Tanks

It is proposed that:

- In areas planned for SUNT facilities where geophysical surveys have been conducted, ground truthing will be accomplished to confirm initial results. If USTs are confirmed, they will be removed in accordance with applicable county, State, and Federal regulations.
- Geophysical surveys to confirm the presence of USTs will be completed prior to construction activities in areas identified for SUNT development that have not been previously surveyed.

Asbestos

- A complete detailed asbestos survey and sampling program is proposed on all buildings slated for modification and/or demolition. If the presence of asbestos is confirmed, appropriate remedial measures should be implemented in accordance with applicable State and Federal regulations.

4.12 SOCIOECONOMICS

To estimate the nature and extent of socioeconomic impacts, the Economic Impact Forecast System (EIFS), an interactive computer system for evaluating socioeconomic impacts of military base mission changes on a user-defined region--in this case, the two-county area of Yuba and Sutter Counties--was used. EIFS was developed by the Construction Engineering Research Laboratory of the U.S. Army Corps of Engineers and is maintained by the Department of Urban and Regional Planning of the University of Illinois at Urbana-Champaign. EIFS has a large data

base of socioeconomic information on every county in the United States, which can be incorporated into economic models to generate estimates of the effects on specified county or multi-county areas of changes in construction and operating activities at military bases. Estimates of construction and personnel requirements for the SUNT relocation developed by Beale and Mather AFB were input to the EIFS models to produce projections of likely changes in area population, employment, incomes, school-age children, and government expenses and revenues. These changes are evaluated below in the context of the baseline characteristics of the study region so that conclusions may be drawn as to the extent of the action's socioeconomic impacts.

Impact-Generating Factors. The primary causes of socioeconomic impacts on the residents of Yuba and Sutter Counties will be changes in base personnel levels and new construction of facilities to accommodate the move.

The SUNT relocation's impact on the base's total annual operating costs is estimated at about \$72 million per year, based on the change in total base personnel. In light of the fact that the local and/or regional area around Beale AFB will experience an increased demand for goods and services, this increase is considered to be an overall beneficial impact.

Demographics. Most of the 829 new permanent personnel are expected to relocate over time from Mather AFB and the Sacramento area to Beale AFB and the Marysville area. The Mather AFB personnel and their dependents will account for most, but not all of the population increase that the SUNT relocation could cause. The economic stimulus of the base expansion is projected to induce secondary employment in the region, which could, in turn, attract some relocation of job seekers from outside the region.

Taking induced employment-related population growth into account, it is estimated that the total increase in Yuba-Sutter counties' population due to the SUNT relocation could be approximately 4,100 persons. This increment would represent an addition of around 3.3 percent to the two-county area's projected 1993 population of about 125,100 people. Thus, the projected increment of population due to the relocation exceeds historical average rates, but the impact is not considered to be significant because this is a one-time change and not a continuing growth element.

Employment. The SUNT relocation will generate new jobs in the region. In the short term, construction of the SUNT facilities is projected to require approximately 800 workers in the peak year (FY 92) of the 3-year construction phase (FY 91-93). The construction labor force is projected to number about 300 workers in FY 91 and 170 workers in FY 93. (This estimate was developed based on the programmed costs and assumes that 34.2 percent of cost is for labor.) The infusion of new construction payroll into the regional economy, plus procurement of materials and services from local vendors, will also stimulate secondary employment in support and service sectors. The EIFS model projects that total direct and indirect regional employment attributable to the construction work will amount to about 3,465 person-years over the 3-year construction phase.

The SUNT relocation will also cause a long-term net increase in direct employment of permanent base military and civilian personnel to about 829 persons. Their consumption expenditures, plus those of the navigation students during their stay at Beale, will support and stimulate other employment in the region. The EIFS model projects that total regional direct and indirect employment supported by the SUNT activities will average about 2,200 jobs.

Since contracts have not been awarded for the construction work or procurement of materials and services for the SUNT operation, it is not possible to identify which portion of the base's overall employment and income effects would accrue specifically to Yuba and Sutter Counties. It seems reasonable that one-fourth of the construction work would fall to Yuba and Sutter County contractors and construction workers because of their proximity to the site. The larger share of the work would probably go to Sacramento-based contractors who have greater resources. It is estimated, therefore, that direct and indirect construction employment accruing to Yuba and Sutter County residents from the SUNT relocation would amount to approximately 865 person-years of work, with the peak level totaling approximately 200 jobs in FY 1992. This number would represent an increase of about 0.5 percent of the projected 1992 resident civilian employed labor force, which is considerably less than the area's annual average growth rate of 1.3 percent per year. The projected short-term increment in construction-related local employment due to the SUNT is not regarded as a significant impact and may result in a net beneficial impact to the area.

It is estimated that the majority of the indirect employment stimulated by the SUNT operation would be in Yuba and Sutter Counties because much of the secondary employment would be due to local consumption spending by the base personnel. A two-thirds proportion of the total SUNT operation-generated employment accruing to the two-county area seems reasonable. This would amount to around 1,470 jobs (with a subjective margin of error of plus or minus 25 percent or 370 jobs). This one-time increase in jobs would occur between FY 91 and FY 93 and is not regarded as a significant socioeconomic impact and may result in a net beneficial impact to the area.

Personal Income. Costs of constructing the SUNT facilities have been estimated at \$148.6 million, of which expenses for construction labor, materials and equipment, and design services to be expended within the 50-mile radius EIR of Beale AFB are projected at approximately \$122.3 million. The regional share was estimated on the basis of the distribution of construction expenses for the base in FY 1988, which showed that 82.3 percent of that year's total construction expenditures went to businesses and workers in the region (ERIS, 1988). The economic impact of the SUNT construction outlays on the EIR would amount to about \$193 million over the three years of scheduled work, according to the EIFS forecast model. This figure represents the total increase in business volume in the EIR due to the realignment construction work at Beale AFB. About \$70 million of the business volume change represents income accruing to households in the region (including on-and off-base military personnel) due to the infusion of construction payroll spending and local area procurement of construction materials and services. Assuming that one-fourth of the new income, or about \$18 million, actually accrued to Yuba and Sutter County households, the increment to the two-county area's total personal income of approximately \$1.4 billion would be about 1.3 percent. This amount is less than the

area's recent trend of 3.5 percent per year since the early 1980s, which suggests that the construction income impacts would be insignificant and easily accommodated by the Yuba City MSA.

Base operating expenses are estimated to increase by about \$72 million per year after completion of the SUNT relocation. This estimate is based on the projected net change in base personnel applied to the base's total operating expenses in FY 88. About two-thirds of the base's FY 1988 expenditures accrued to businesses and workers in the EIR (ERIS, 1988). The regional economic impact of this spending, as measured by the total annual increase in regional business volume attributable to the SUNT-related activities, is projected to be about \$97 million per year, according to the EIFS forecast model. Of this figure, about \$48 million per year would accrue to regional households as personal income. As a measure of the significance of this increment of income, if two-thirds (\$32 million) of the total were to accrue to Yuba and Sutter County households, the increase would be about 2.3 percent of the total regional personal income of \$1.4 billion. This is substantially below the 3.5 percent per year actually being experienced in Yuba and Sutter Counties, leading to the conclusion that the SUNT operations would have a small, but positive impact on the local economy.

Housing. The increase in Beale AFB's military and civilian personnel from the SUNT relocation is estimated at 1,292 military and 310 civilians. Development of additional housing under a build-to-lease arrangement with a private developer is being considered. No decision has been reached on this issue. Rental vacancy rates in Yuba and Sutter Counties are running at approximately 5 percent, or 2,180 rental units (in 1987). In addition, some transferring personnel will commute from their current homes. Thus, the incremental demand associated with the SUNT relocation would not be expected to strain the local housing market supply or prices, and represents an insignificant impact.

Education. The number of school-age children that may be associated with the SUNT relocation is estimated at between 450 and 475. The wide range is due to the uncertainty of how many navigation students at any one time might have dependent children and the amount of induced local population growth that the SUNT program might stimulate. Most Beale AFB dependent children attend the Wheatland elementary and high schools, which have ample physical capacity to accommodate the potential increase in enrollment. Excess capacity in these schools is approximately 1,660 seats--930 at the elementary level and 730 at the high school levels.

The primary issue for schools is financial assistance for dependents of Federally-employed personnel, which is provided under the Federal education impact assistance program. If the assistance program is not decreased, any increase in enrollments can be accommodated by hiring more teachers to maintain proper student-teacher ratios. In FY 88-89, education impact assistance for the Wheatland schools is projected to amount to \$2.2 million, assuming 100 percent funding of the program (Cole, 1989). The \$2.2 million in impact assistance was associated with a total of about 1,546 Category A and B students in the two Wheatland school districts. Assuming the level of funding remains constant and all the dependents of SUNT personnel attend the Wheatland schools, the education impact assistance funding would increase by between approximately \$652,600 and \$688,850 per year. These funds would represent an

increment to the two districts' revenue sources of about 7 percent based on their FY 87-88 financial resources, totaling \$9.6 million (Davis, 1990). Therefore, additional demands on the local education system are not expected to be significant.

Community Services and Facilities. The realignment of Beale AFB includes additions to BOS facilities, as described in Section 2, and relocation of support personnel from Mather AFB. These additional facilities and personnel will bring community services and facilities up to the strength required to support the realignment.

4.12.1 Cumulative Impacts

The relocation of the SUNT to Beale AFB will have a small but beneficial impact to the economic base of Yuba and Sutter counties. This impact will more than offset the socioeconomic impacts to the region as a result of the recent deactivation of the SR-71 program at Beale AFB. Impacts of the realignment to housing and education, although expected to be insignificant, may be seen as partially replacing loss of demand for these services resulting from the deactivation of the SR-71 program.

4.12.2 Mitigation Measures

Based on the above analyses of anticipated socioeconomic changes as a result of the SUNT relocation, no mitigation measures are proposed.

4.13 UNAVOIDABLE ADVERSE IMPACTS

The impact analysis presented above indicates that the realignment will not create any unavoidable adverse impacts that cannot be mitigated to insignificant levels.

4.14 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The short-term use of the environment necessary to accommodate the realignment at Beale AFB is not expected to result in significant long-term adverse impacts on the productivity of the environment. The realignment represents a commitment of a relatively small portion of Beale AFB to a more intensive land use. Once the SUNT facilities are in place, use of the acreage for other purposes will be precluded. However, facilities could be removed and the land restored to approximately its original condition at the end of the project's useful lifetime. The affected areas should be available at that time for other possible beneficial land uses, contingent upon the then-prevailing plans and missions of Beale AFB.

Environmental protection measures would be included in the project to minimize the effects of potential environmental impacts. Most environmental impacts would be of short duration, and recovery from impacts is expected to be relatively rapid. As a result, there should be no significant narrowing of the range of beneficial uses of the environment, and no long-term significant risks to health and safety would result from the realignment.

4.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitments of natural resources that would result from the proposed action include consumption of fossil fuels for transportation/equipment and generation of electricity; use of materials during construction that cannot be recycled at the end of the project's useful lifetime; and use of energy for the production of materials used in new equipment and facilities. The relatively small scope of the realignment would not present any significant impacts.

The realignment contains no design elements that pose any danger of an environmentally significant accident, as long as recommended mitigation measures are implemented. In contrast, the primary purpose of the SUNT mission is to afford state-of-the-art training to military personnel in support of a strong, safe, and effective national defense.

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APPENDIX A
Average Daily Air Emissions Inventory
For Yuba County

TABLE A-1

1983 Base Year Inventory
Average Daily Air Emissions
Yuba County

Source Category	Emissions (tons/day)					
	Total Organic Gases	Reactive Organic Gases	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	Particulate Matter < 10 microns
STATIONARY SOURCES						
Fuel Combustion	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-
Petroleum Refining	1.2	0.9	1.3	0.5	-	0.1
Other Manufacturing/Industrial	-	-	-	0.1	-	-
Other Services and Commerce	0.2	0.1	1.1	0.2	-	0.1
Residential	-	-	-	-	0.1	-
Other	1.4	1.0	2.4	0.8	0.1	0.2
TOTAL FUEL COMBUSTION						
Waste Burning	1.1	0.4	8.9	-	-	1.0
Agricultural-Debris	-	-	0.1	-	-	-
Range Management	-	-	0.4	-	-	-
Forest Management	-	-	-	-	-	-
Incineration	0.1	-	0.6	-	-	0.1
Other	1.2	0.4	10	-	-	1.1
TOTAL WASTE BURNING						
Solvent Use	0.1	0.1	-	-	-	-
Dry Cleaning	0.1	0.1	-	-	-	-
Degreasing	0.3	0.3	-	-	-	-
Architectural Coating	0.2	0.2	-	-	-	-
Other Surface Coating	0.3	0.3	-	-	-	-
Asphalt Paving	0.4	0.4	-	-	-	-
Consumer Products	0.1	0.1	-	-	-	-
Industrial Solvent Use	1.5	1.5	-	-	-	-
TOTAL SOLVENT USE						

TABLE A-1 (cont'd)

Source Category	Emissions (tons/day)					Particulate Matter < 10 microns
	Total Organic Gases	Reactive Organic Gases	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	Particulate Matter
Petroleum Process, Storage & Transfer	-	-	-	-	-	-
Petroleum Refining	0.4	0.4	-	-	-	-
Petroleum Marketing	0.1	0.1	-	-	-	-
Other	0.5	0.5	-	-	-	-
TOTAL PETROLEUM PROCESS, STORAGE & TRANSFER						
Industrial Processes	-	-	-	-	-	0.1
Food and Agriculture	-	-	-	-	-	0.1
Mineral Processes	-	-	-	-	-	-
Wood and Paper	-	-	-	-	-	0.2
TOTAL INDUSTRIAL PROCESSES						
Misc. Processes	1.1	1.1	-	-	-	-
Pesticide Application	-	-	-	-	-	2.8
Farming Operations	-	-	-	-	-	0.8
Construction and Demolition	-	-	-	-	-	3.2
Entrained Road Dust - Paved	-	-	-	-	-	1.4
Entrained Road Dust - Unpaved	0.1	0.1	0.8	-	-	0.1
Unplanned Fires	1.2	1.2	0.8	-	-	8.3
TOTAL MISC. PROCESSES				0.8	0.1	9.8
TOTAL STATIONARY SOURCES	5.8	4.6	13			

TABLE A-1 (cont'd)

Source Category	Emissions (tons/day)					
	Total Organic Gases	Reactive Organic Gases	Carbon Monoxide	Oxides of Nitrogen	Oxides of Sulfur	Particulate Matter < 10 microns
MOBILE SOURCES						
On Road Vehicles	2.4	2.2	15	1.5	0.1	0.1
Light Duty Passenger	1.3	1.2	8.2	0.9	-	-
Light and Medium Duty Trucks	0.3	0.3	3.8	0.3	-	-
Heavy Duty Gas Trucks	0.1	0.1	0.4	1.0	0.1	0.1
Heavy Duty Diesel Trucks	0.1	0.1	0.1	-	-	-
Motorcycles	4.2	3.9	28	3.7	0.2	0.2
TOTAL ON ROAD VEHICLES						
Other Mobile	0.4	0.4	1.5	-	-	-
Off Road Vehicles	0.3	0.3	0.3	1.0	0.1	0.1
Trains	0.7	0.7	1.1	0.3	-	-
Aircraft - Government	-	-	1.1	-	-	-
Aircraft - Other	0.3	0.3	3.2	0.9	0.1	0.1
Mobile Equipment	0.2	0.2	0.9	-	-	-
Utility Equipment	1.9	1.9	8.1	2.2	0.2	0.2
TOTAL OTHER MOBILE						
TOTAL MOBILE SOURCES	6.1	5.8	36	5.9	0.4	0.4
TOTAL YUBA COUNTY	12	10	49	6.7	0.5	10

NOTE: "-" indicates that emission estimates rounded off to less than 0.1 ton per day.

SOURCE: CARB, 1986.

APPENDIX B
Archaeological, Cultural, and
Historic Resources

APPENDIX B

Archaeological, Cultural and Historic Resources

B.1 ARCHAEOLOGICAL SENSITIVITY ON BEALE AFB

The sensitivity zones for prehistoric resources (Figure B-1) were delineated on the basis of physiographic characteristics believed to influence prehistoric activities and, in turn, the occurrence of certain types of remains. Descriptions of the zones appear below.

Perennial Streams (Zone A) - Prehistoric activities associated with perennial streams would occur along the Dry Creek/Best Slough system and possibly Hutchinson Creek. These streams not only would have provided a stable water source for prehistoric inhabitants of the base, but would also support a riparian habitat containing relatively abundant resources. Any habitation sites on the base are likely to be situated in this zone.

Lower Foothills (Zone B) - The low, oak-covered foothills on the eastern portion of the base probably experienced the second most intensive prehistoric use of any area of the base. Surveys in nearby areas suggest that these hills were used for resource gathering and processing, and are likely to contain isolated bedrock milling features. Hunting blinds, though not expected anywhere on the base, are most likely to be found in this zone. Habitation sites may occur at the confluences of seasonal drainages in this zone, but are less likely than along perennial streams.

Seasonal Streams (Zone C) - Hutchinson Creek and Reeds Creek host minor riparian associations and may have provided economically important resources (grasses, sedges, forbs, and animals), particularly in the spring and early summer. Archaeological manifestations of the use of this zone are expected to be sparse because of the linear distribution of the resources.

Vernal Pool Terrain (Zone D) - This is the area of the base where vernal pools are most frequent. Vernal pools have elsewhere been recognized to have provided minor concentrations of critically timed resources, and have been observed to be associated with sparse scatters of artifacts (Roop, 1981).

Other Areas (Zone E) - Areas away from water sources or prehistorically significant resources are generally unlikely to contain archaeological sites, but may have contained microenvironmental resources not predictable based on present information. Surveys of nearby areas, however, indicate that these areas were rarely used.

B.2 PREVIOUSLY RECORDED ARCHAEOLOGICAL AND HISTORIC SITES

Table B-1 and B-2 present information relative to previously recorded archaeological and historic sites in Beale AFB.

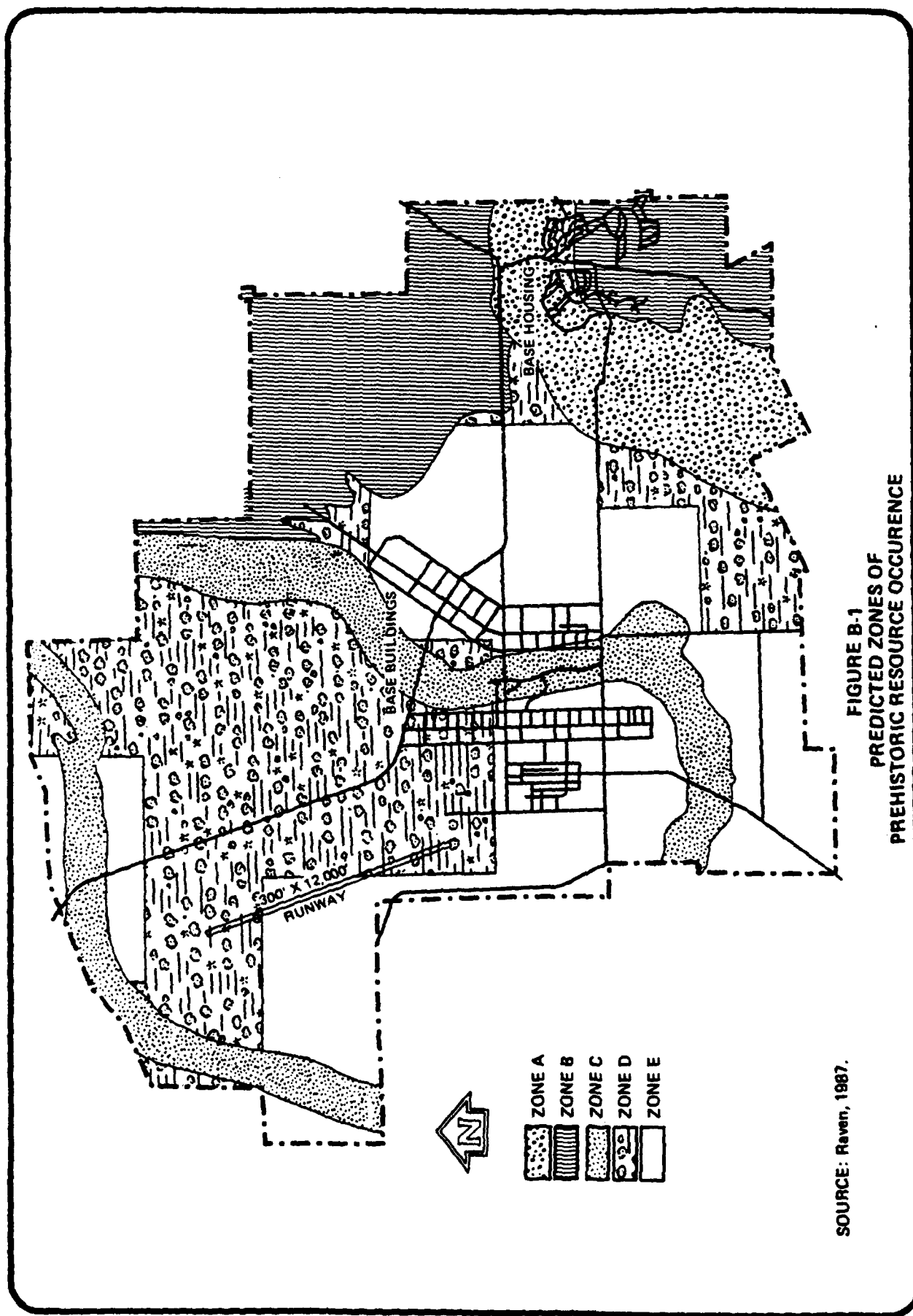


TABLE B-1
Previously Recorded Archeological Sites on Beale Air Force Base

<u>Site No.</u>	<u>Description</u>	<u>National Register Status</u>	<u>Potential Effect</u>	<u>Reference</u>
YUB-1157	Lithic scatter, bedrock mortars (64)	Eligible	Outside APE	Donovan 1984
YUB-1161	Lithic scatter	Eligible	Within APE	Donovan 1984
YUB-1162/H	Housepad, introduced trees, scatter of domestic debris	Recommended not eligible	Outside APE	Donovan 1984
YUB-1163/H	Foundations (4), introduced trees	Recommended not eligible	Outside APE	Donovan 1984
YUB-1164/H	Foundation for residence and barn, introduced trees, stock loading chute, cistern, scatter of domestic debris	Recommended eligible	Outside APE	Donovan 1984
YUB-1165/H	Scatter of historic debris	Recommended not eligible	Outside APE	Donovan 1984
YUB-1166/H	Scatter of domestic and work-related debris	Eligibility undetermined	Outside APE	Donovan 1984
YUB-1167/H	Barn foundation, cistern, cellar depression, scatter of domestic debris	Recommended eligible	Outside APE	Donovan 1984
YUB-1168/H	Scatter of historic debris	Eligibility undetermined	Outside APE	Donovan 1984

TABLE B-1 (cont'd)

<u>Site No.</u>	<u>Description</u>	<u>National Register Status</u>	<u>Potential Effect</u>	<u>Reference</u>
YUB-1169/H	Oval track with two barriers; probably military related	Recommended not eligible	Outside APE	Donovan 1984
YUB-1170/H	Mining tailings, containment dam, runoff collection ditch	Eligibility undetermined	Outside APE	Donovan 1984
BAFBO-1	Bedrock mortars (5)	Recommended not eligible	Outside APE	Donovan 1984
BAFBO-2	Bedrock mortars (11)	Recommended not eligible	Outside APE	Donovan 1984
AF-58-14	Scatter of shell beads (possibly redeposit)	Eligibility undetermined	Outside APE	Donovan 1984
BAF-1	Bedrock mortars (2)	Eligibility undetermined	Outside APE	Site Record
BAF-2	Bedrock mortar (1)	Eligibility undetermined	Outside APE	Site Record
BAF-3	Bridge	Eligibility undetermined	Outside APE	Site Record
BAF-4	Bridge	Eligibility undetermined	Outside APE	Site Record
BAF-5	Bridge	Eligibility undetermined	Outside APE	Site Record
BAF-6	Bedrock mortars (2)	Eligibility undetermined	Outside APE	Site Record

TABLE B-1 (cont'd)

<u>Site No.</u>	<u>Description</u>	<u>National Register Status</u>	<u>Potential Effect</u>	<u>Reference</u>
BAF-7	Foundations, scatter of domestic and work-related debris, one slab metate	Eligibility undetermined	Outside APE	Site Record
BAF-8	Bedrock mortars (16)	Eligibility undetermined	Outside APE	Site Record

TABLE B-2

Historical Locations on Beale Air Force Base

<u>Resource Type</u>	<u>Number</u>
Unidentified Structures	51
Homesteads	23
Roads	19
Mining Ditches	4
Schools	3
Trails	2
Hotels	2
Business (Riley & Company)	1
Community (Erle)	1
Dance Hall (Community of Erle)	1
Cemetery	1
TOTAL	108

B.3 SITES ELIGIBLE FOR THE NATIONAL REGISTER

As previously shown on Table B-1, two of the archaeological sites at Beale AFB have been determined eligible for inclusion on the National Register. A brief description of these sites is provided below.

Site 1 - YUB-1157

This site is located in the vicinity of Best Slough in the southern portion of Beale AFB. It contains a number of bedrock mortar pits in four zones of exposed, decomposed sandstone.

Site 2 - YUB-1161

This site is located west of a southwest trending intermittent tributary to Dry Creek south of the family housing area. It appeared to be a short-term, perhaps single use, chipping station where a large number of flakes/debitage have been found.

APPENDIX C

Noise Metrics

APPENDIX C

Noise Metrics

C.1 BASIC ATTRIBUTES OF SOUND

Noise may be defined as unwanted sound. An acceptable definition of sound is that it is a physical disturbance of the atmosphere that can be detected by the human ear. Factors that influence people's perception of such physical disturbances as "noise" are:

- The magnitude of the sound level.
- The duration of the sound event.
- The number of such events in a given time period (such as a day).
- The time of day of these events.

The results of this analysis qualify these effects in terms of the noise metrics used in this report. These are describe in the following sections.

C.2 A MEASURE OF INSTANTANEOUS SOUND LEVEL

A basic fact of human hearing is that the human ear is more sensitive to sound energy at higher frequencies than at lower frequencies (that is, the ear does not have a "flat" frequency response). Furthermore, the ear's relative sensitivity to different frequencies changes somewhat with the level of the sound. This effect, however, is most pronounced at lower sound levels. Any sound level measure that purports to correlate well with people's subjective assessment of the loudness or noisiness of sound must account for this variable sensitivity to differing frequencies.

One approach for obtaining an accurate correlation between measured sound levels and subjective human response was the introduction of frequency weighing networks in sound level meters. The sound level meter is a device for measuring sound pressure levels. The small pressure fluctuations are detected by an extremely sensitive microphone and transformed into an electrical signal. By means of electronic circuitry, this electrical signal is amplified and displayed on a meter in decibels (dB). With origins dating back to the mid-1930s, the A-weighting network is still in widespread international use today. This network discriminates against the lower frequencies and very high frequencies, to which the ear is less sensitive, according to a relationship approximating a person's subjective reaction in terms of loudness at moderate sound levels.

In past laboratory and field studies, it has been found that people make relative judgments of the "loudness," or the "annoyance" or "disturbance" of sounds that correlate quite well with the A-scale levels of those noises. However, a change of 10 dB in the A-level corresponds roughly to a subjective judgment of the halving or doubling of the loudness or noisiness. In other words, a sound judged to be twice as loud as another sound would only have a sound level approximately 10 dB greater than the first sound (even though the 10 dB change corresponds to a factor of 10 in actual

sound energy). On the other hand, the difference of one or two dB between sounds, although probably detectable if heard within a short time interval, would not be judged to be significantly different in loudness by most observers. Table C-1 shows the relationships between A-weighted sound level and relative loudness for every-day noise sources.

C.3 A MEASURE OF INDIVIDUAL NOISE EVENTS

Of major interest in this report is the noise produced by aircraft during takeoff and landing operations. These noises fall into the broad category of "transient" noises, which come and go in a finite period of time. Aircraft takeoff, landing, and flyover noises may be characterized as sound signals that increase in level, generally over a period of several seconds, to a maximum value, then decrease, and eventually merge into the fluctuating background noise.

Dependent primarily on the type of aircraft, type of operations, and distance from the observer to the aircraft, the maximum flyover noise levels will vary widely in magnitude ranging from levels unnoticed in the presence of other background noises to levels sufficiently high to create feelings of annoyance or to interfere with speech or sleep.

The duration will also vary depending on the proximity of the aircraft, speed, and orientation with respect to the observer. Unfortunately, the maximum noise level rating ignores the duration aspect of the event. Extensive psychophysical research has shown that for two events of the same maximum level, the longer of the two will in variably be rated as the noisier or more annoying.

Over the years, several mathematical models have been proposed to account for this observation. The model that is in common usage today asserts that subjective annoyance is related to the total amount of perceived acoustic energy in the noise intrusion. Computationally, the total energy is determined by measuring the instantaneous A-level at closely spaced intervals in time (e.g., every $\frac{1}{4}$ second) and summing these readings by logarithmic additions. The analyses in this report are based on the SEL (Sound Exposure Level), which is the energy summation of the A-level over the upper 10 dB of the noise signal. The SEL is being widely used to describe the noise of a variety of transportation noise sources.

C.4 A MEASURE OF DAILY NOISE EXPOSURE

Descriptors of individual aircraft noise intrusions are helpful in comparing one aircraft with another or in relating the aircraft noise to other sources of noise in the community. However, community response to aircraft noise is not based on a single event, but on a series of events over the day. Factors that have been found to affect subjective assessment of the daily noise environment include (1) the noise levels of individual events, (2) the number of events per day, and (3) the time of day at which the event occurs. Most environmental descriptors of noise are based on these three factors, although they may differ considerably in the manner in which the factors are taken into account.

TABLE C-1

Loudness and Sound Levels of Everyday Noise

<u>Sound</u>	<u>Sound Level, dB(A)</u>	<u>Relative Loudness (Approx.)</u>	<u>Relative Sound Energy</u>
Jet Plane, 100 Feet	130	128	10,000,000
Rock Music with Amplifier	120	64	1,000,000
Thunder	110	32	100,000
Boiler Shop, Power Mower	100	16	10,000
Orchestral Crescendo at 25 Feet, Noisy Kitchen	90	8	1,000
Busy Street	80	4	1,000
Interior of Department Store	70	2	10
Ordinary Conversation 3 Feet Away	60	1	1
Quiet Automobile at Low Speed	50	1/2	.1
Average Office	40	1/4	.01
City Residence	30	1/4	.001
Quiet Country Residence	20	1/16	.0001
Rustle of Leaves	10	1/32	.00001
Threshold of Hearing	0	1/64	.000001

Source: U.S. Department of Housing and Urban Development Circular 1390.2

Any single-number descriptor of a complex noise environment represents a drastic simplification of the real-world conditions. However, the administrative and general usefulness and the simplicity of a single number descriptor results in widespread use of such measures for regulatory, administrative, and planning purposes. The U.S. Air Force has adopted the average day-night sound level (L_{dn}) as the measure of the noise regulations, which is widely employed throughout the country as a descriptor of community noise environment.

The L_{dn} represents the equivalent level (also denoted as average level) over a 24-hour period with the noise occurring at night (10 p.m. to 7 a.m.) multiplied by a factor of 10 (10 dB). The L_{dn} incorporates a 10-dB nighttime weighing for noises occurring between 10 p.m. and 7 a.m. to account for the presumed greater potential disturbance of people by nighttime noise. This presumption is partially substantiated by community complaint studies and social survey data that indicate that the same noise environment is considered more disturbing or annoying during the nighttime than during the daytime. There is a greater need at night for a quiet environment in which to sleep and relax. In most communities, the exterior background noise level decreases during the night by 10 dB or more, and the activity inside homes also decreases. These both contribute to a lowering of interior noise levels. Consequently, any high-level intrusive noise can be expected to be more disturbing during the night.

The L_{dn} may be determined in two different ways. It may be calculated by measuring the noise either continuously or on a discrete sampling basis throughout the 24-hour period. In practical applications, L_{dn} is usually computed by sampling the noise one or more times a second and calculating the equivalent level for each hourly period to obtain hourly noise levels. The L_{dn} is then computed from the set of 24 hourly levels, after adding the appropriate weighing to the night levels.

C.5 L_{dn} CRITERION VALUES

Current Air Force guidelines, in the Air Installation Compatibility Use Zone (AICUZ) programs, stipulate L_{dn} as the upper limit for residential development unless special noise insulation features are incorporated into buildings. The choice of 65 dB involves an administrative decision that necessarily involves tradeoffs between desire to eliminate all community annoyance with aircraft noise, consideration of economic and political factors, and community and military needs for air transportation.

The choice of a 65 dB L_{dn} criterion is supported by regulations and administrative standards adopted by other governmental agencies. For example, HUD has adopted an L_{dn} level of 65 dB as the upper limit of acceptable aircraft and non-aircraft noise with regard to residential development and governmental funding for community planning. The L_{dn} value used by the FAA to define residential noise impact areas around airports is 65 dB. A recent American National Standard Institute standard on land use planning with respect to noise also suggests a limit of L_{dn} 65 for residential land use.

The above discussion suggests that the criterion of 65 dB is reasonable in order to achieve a balance that takes into consideration the air transportation needs of the

community and the desired goals to minimize annoyance and noise interference. However, it is clear that setting a 65 dB L_{dn} criterion will not eliminate all annoyance or community dissatisfaction. And for some activities, the L_{dn} criterion should be supplemented with other criteria regarding levels of individual noise intrusions.

In the absence of aircraft noise, people in suburban and urban areas are exposed to considerable noise due to other sources, the most prevalent of which is motor vehicle traffic. Figure C-1 shows the approximate range of day-night levels for different types of community noise exposure.

C.6 COMPATIBLE LAND USE

Most studies on residential aircraft noise compatibility recommend no residential uses in noise zones (NZ) above L_{dn} 75. Usually no restrictions are recommended below L_{dn} 65. Between L_{dn} 65-75, there is currently no consensus. These areas may not qualify for federal mortgage insurance is residential categories according to 24 CFR 51 (adopted July 12, 1979). In many cases, the approval of the U.S. Department of Housing and Urban Development (HUD) requires noise attenuation measures, the Regional Administrator's concurrence, and an Environmental Impact Statement. Past Air Force experience and the lack of definitive criteria do not justify an Air Force recommendation to categorically prohibit residential uses in these areas, although these uses may be undesirable. However, wherever possible, residential uses should be located below L_{dn} 65.

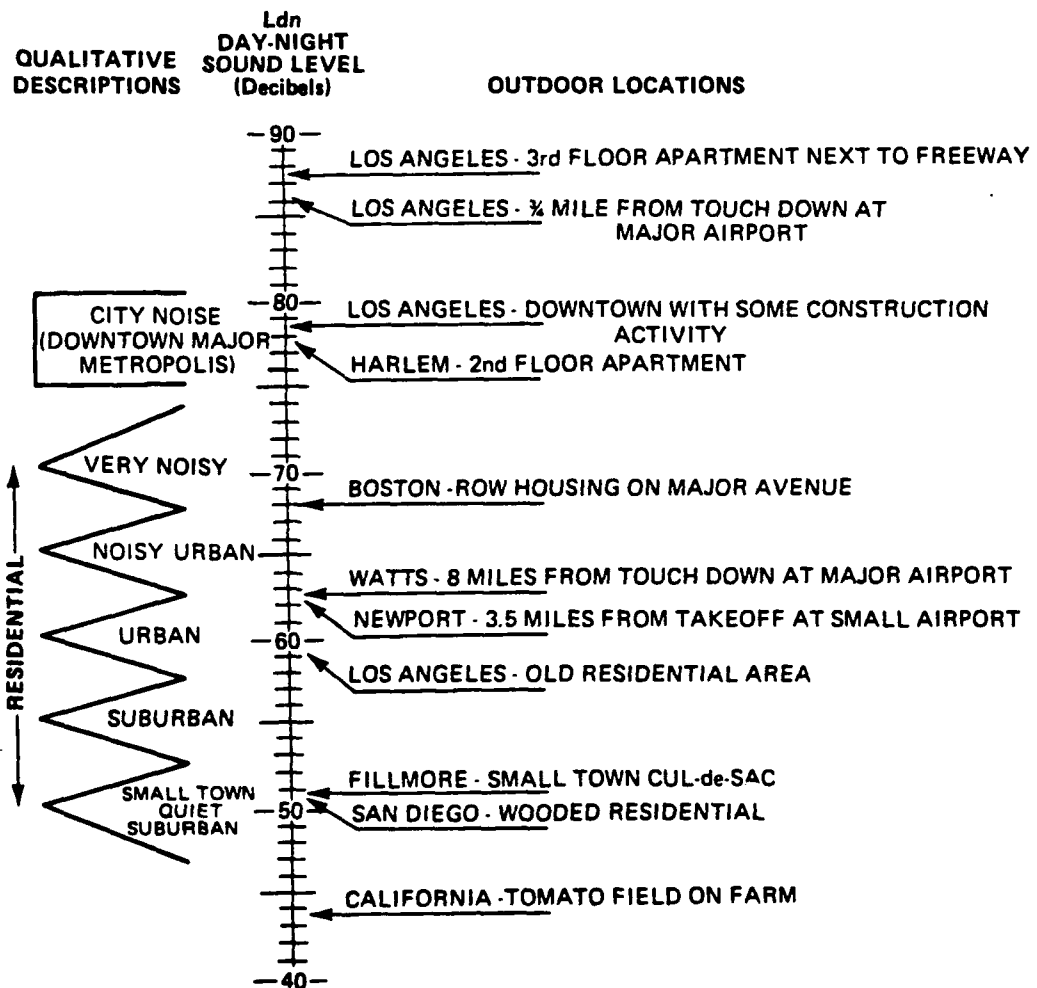
Most industrial/manufacturing uses are compatible in the airfield environs. Exceptions are uses such as research or scientific activities that require lower noise levels. Noise attenuation measures are recommended for portions of buildings devoted to office use, receiving the public, or where normal background noise level is low.

The transportation, communications, and utilities categories have a high noise level compatibility because they generally are not people intensive. When land is used for these purposes, the use is generally very short in duration. Where buildings are required for these uses, additional evaluation is warranted.

The uses of commercial/retail trade and personal and business services categories are compatible without restriction up to L_{dn} 70; however, they are generally incompatible above L_{dn} 80. Between L_{dn} 70-80, attenuation should be included in the design and construction of buildings.

The nature of most uses in the public and quasi-public services category requires a quieter environment; attempts should be made to locate these uses below L_{dn} 65, or provide adequate attenuation.

Areas where noise levels exceed L_{dn} 75 are not generally recommended for recreational uses. Buildings associated with golf courses and similar uses should be sound attenuated.



SOURCE: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, INFORMATION ON LEVELS OF ENVIRONMENTAL SOUND REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE WITH THE ADEQUATE MARGIN OF SAFETY. MARCH 1974, p. 14.

FIGURE C-1
EXAMPLES OF AVERAGE DAY-NIGHT
SOUND LEVELS, L_{dn}

With the exception of forestry activities and livestock farming, uses in the resource production, extraction, and open space categories are generally compatible without restriction.

C.7 NOISEMAP PROGRAM DOCUMENTATION

The NOISEMAP computer program is a comprehensive set of computer routines for calculating noise exposure contours for airport operations. The program was developed under sponsorship of the U.S. Air Force. The program permits calculation of the noise environment in terms of L_{dn} , noise exposure forecast, or community noise equivalent levels. With simple modification of the input data, NOISEMAP also can develop noise level contours, typically in terms of effective perceived noise level or sound exposure level for individual aircraft operations.

L_{dn} contours produced by NOISEMAP are relied upon by the Air Force as the primary descriptor of air base noise exposure. It forms a primary technical tool for the AICUZ program. NOISEMAP is also used by the U.S. Navy, U.S. Army, U.S. Environmental Protection Agency, and several state agencies and consultants to develop noise environmental contours for civil and military airports. NOISEMAP is approved by the Federal Aviation Administration (FAA) for use in FAA-funded airport studies.

The program and underlying technical concepts are very well documented in the technical reports. The basic modeling concepts, guidelines for acquiring noise performance data, application guide, and the basic computer program are described in the following five reports:

Bishop, D.E., Community Noise Exposure Resulting from Aircraft Operations: Application Guide for Predictive Procedure, Air Force Report AMRL-TR-73-105, November 1974 (AD A004818).

Galloway, W.J., Community Noise Exposure Resulting from Aircraft Operations: Technical Review, Air Force Report AMRL-TR-73-106, November 1974 (AD A004822).

Bishop, D.E., and Galloway, W.J., Community Noise Exposure Resulting from Aircraft Operations: Acquisition and Analysis of Aircraft Noise and Performance Data, Air Force Report AMRL-TR-73-107, August 1975 (AD 017741).

Reddingius, N.H., Community Noise Exposure Resulting from Aircraft Operations: Computer Program Operator's Manual, Air Force Report AMRL-TR-73-108, July 1974 (AD 785360).

Horonjeff, R.D., Kandukuri, R.R., and Reddingius, N.H., Community Noise Exposure Resulting from Aircraft Operations: Computer Program Description, Air Force Report AMRL-TR-73-109, November 1974 (AD A004821).

The original computer program operator's manual has been updated to reflect program changes and is available as an Air Force report:

Beckmann, J.M., and Seidman, H., Community Noise Exposure Resulting from Aircraft Operations: NOISEMAP 3-4 Computer Program Operator's Manual, Air Force Report AMRL-TR-78-109, December 1978 (AD A068518/OGA).

Basic noise information for military aircraft is documented in the following six volume report, prepared by the U.S. Air Force Aerospace Medical Research Laboratory:

Speakman, J.D., Powell, R.G., and Cole, J.N., Community Noise Exposure Resulting from Aircraft Operations: Acoustic Data on Military Aircraft, Air Force Report AMRL-TR-73-110, November 1977.

- Vol. 1 - Acoustic Data on Military Aircraft (AD A053699).
- Vol. 2 - Air Force Bomber/Cargo Aircraft (AD A053700).
- Vol. 3 - Air Force Attack/Fighter Aircraft (AD A053701).
- Vol. 4 - Air Force Trainer/Fighter Aircraft (AD A053702).
- Vol. 5 - Air Force Propeller Aircraft (AD A055079).
- Vol. 6 - Navy Aircraft (AD A056217).

A military aircraft noise data digital tape file for use with NOISEMAP is available upon request from:

6570th Aerospace Medical Research Laboratory
AMRL/BBE
Air Force Systems Command
Wright-Patterson AFB, Ohio 45433

Computer programs for computing noise versus distance curves from noise data at single ground locations have been developed by the University of Dayton and are described in the following report:

Mohlman, H. T., Computer Programs for Producing Single-Event Aircraft Noise Data for Specific Engine Power and Meteorological Conditions for Use with USAF Community Noise Model (NOISEMAP), Air Force Report AFAMRL-TR-83-020, April 1983.

Base noise and performance characteristics for major civil aircraft were initially collected and described in several reports prepared under EPA sponsorship:

Galloway, W.J., Mills, J.F., and Hays, A.P., Data Base for Predicting Noise from Civil Aircraft: Flight Profile Prediction, BBN Report 2746R, March 1976.

Bishop, D.E., Mills, J.F., and Beckmann, J.M., Effective Perceived Noise Level Versus Distance Curves for Civil Aircraft, BBN Report 2747R, February 1976.

Bishop, D.E., Mills, J.F., and Beckmann, J.M., Sound Exposure Level Versus Distance Curves for Civil Aircraft, BBN Report 2759R, February 1976.

More recently, the civil aircraft noise and performance data have been reviewed and updated for the FAA. These data are incorporated into the current versions of the FAA's Integrated Noise Model airport noise computer program.

Bishop, D.E., and Beckmann, J.M., Civil Aircraft Noise Data for Computation of Aircraft Noise Contours, BBN Report 4440 (draft), November 1980.

Potter, R.C., and Mills, J.F., Aircraft Flight Profiles for Use in Aircraft Noise Prediction Models, BBN Report 4594 (draft), January 1981.

Potter, R.C., and Mills, J.F., Aircraft Flight Profiles for Use in Aircraft Noise Prediction Models, BBN Report 4594 (draft), January 1981.

Following the original development of NOISEMAP, a series of research and sensitivity studies concerned with various aspects of NOISEMAP assumptions and modeling algorithms has been undertaken. Sensitivity refers to the variability of noise contour size and shape resulting from changes in modeling algorithms or input data. These studies are documented in the following Air Force reports:

Bishop, D.E., Dunderdale, T.C., Horonjeff, R.D., and Mills, J.F., Sensitivity Studies of Community-Aircraft Noise Exposure (NOISEMAP) Predictive Procedure, Air Force Report AMRL-TR-75-115, March 1976 (AD A026535).

- Tone Corrections.
- Runup Weightings.
- Temperature and Pressure Altitude.
- Excess Ground Attenuation and Airframe Shielding Algorithms.

Bishop, D.E., Dunderdale, T.C., Horonjeff, R.D., and Mills, J.F., Further Sensitivity Studies of Community-Aircraft Noise Exposure (NOISEMAP) Prediction Procedures, Air Force Report AMRL-TR-116, April 1977 (AD A041781).

- Tone Corrections.
- Excess Ground Attenuation and Fuselage Shielding Models.
- Climatic Variations.

Fidell, S., Test Plan for Aircraft Runup Noise Penalty Evaluation, Air Force Report AMRL-TR-75-110, March 1976 (AD A026209).

Walker, D.Q., Aircraft Sideline Noise: A Technical Review and Analysis of Contemporary Data, Air Force Report AMRL-TR-76-115, April 1977 (AD A042076).

Walker, D.Q., An Analysis of Aircraft Flyover Noise, Air Force Report AMRL-TR-78-8, April 1978 (AD A058522).

Extended capabilities of NOISEMAP to include noise from helicopters and from special aircraft operations are described in the following reports:

Galloway, W.J., Helicopter Noise Level Functions for Use in Community Noise Analyses, Air Force Report AMRL-TR-78-87, December 1978.

Bishop, D.F., Procedures and Data for Predicting Day-Night Levels for Supersonic Flight and Air-to-Ground Gunnery, BBN Report 3715, prepared for the Air Force Civil Engineering Center (draft), August 1978.

The NOISEMAP program has been modified to permit convenient determination of demographic information within noise contour boundaries, as described in the following reports:

Seidman, H., and Bavelly, C., Computer-Aided Collection of Demographic Data within Day-Night Level Contours: Two Test Cases, Air Force Report AMRL-TR-78-39, August 1978.

Seidman, H., Incorporation of Environmental Impact Indices into NOISEMAP, Air Force Report AMRL-TR-81-31, February 1981.

Initial NOISEMAP field validation studies and the development of detailed techniques for field measurement of air base noise for comparison with NOISEMAP predictions have been undertaken. They are documented in the following reports:

Seidman, H., Horonjeff, R.D., and Bishop, D.E., Validation of Aircraft Noise Exposure Prediction Procedure, Air Force Report AMRL-TR-76-111, April 1977 (AD A041674).

Rentz, P.E., and Seidman, H., Development of NOISECHECK Technology for Measuring Aircraft Noise Exposure, Air Force Report AMRL-TR-78-125, May 1980.

Bishop, D.E., Harris, A.H., Mahoney, J., and Rentz, P.E., NOISECHECK Procedures for Measuring Noise Exposure from Aircraft Operations, Air Force Report AMRL-TR-80-45, November 1980.

Lee, R.A., Field Studies of the Air Force Procedures (NOISECHECK) for Measuring Community Noise Exposure from Aircraft Operations, Air Force Report AMRL-TR-82-12, March 1982.

Additional NOISEMAP research studies are underway. Special effort has been made to extend the usability of the program for specific Air Force needs through the development of a special preprocessor program to handle military aircraft noise and performance data. Modeling concepts and algorithms (for instance, those concerned with propagation over ground and the transition between air-to-ground and ground-to-ground propagation) are undergoing continuing study. Modification of NOISEMAP to allow convenient calculation of day-night levels at specified points, rather than

computation at an array of grid positions, is being undertaken. The results of these studies will be described in future Air Force-sponsored reports.